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THE IMPACT OF PERMANENT CHANGE OF  
STATION MOVES ON AIR FORCE ENLISTED  
FAMILY INCOME FOR AVIONICS AND  
NON-AVIONICS PERSONNEL

THESIS

Stephen A. Giuliano  
Captain, USAF

AFIT/GCA/LSY/88S-4

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**AFIT/GCA/LSY/88S-4**

**THE IMPACT OF PERMANENT CHANGE OF STATION  
MOVES ON AIR FORCE ENLISTED FAMILY INCOME  
FOR AVIONICS AND NON-AVIONICS PERSONNEL**

**THESIS**

**Presented to the Faculty of the School of Systems and Logistics  
of the Air Force Institute of Technology  
Air University  
In Partial Fulfillment of the  
Requirements for the Degree of  
Master of Science in Cost Analysis**

**Stephen A. Giuliano, B.B.A.**

**Captain, USAF**

**September 1988**

**Approved for public release; distribution unlimited**

Preface

The purpose of this study was to examine the impact of permanent change of station moves on the family income of Air Force enlisted personnel in Avionics and Non-avionics career fields. The effect of mobility was analyzed for four components of total family income: member's military salary, spouse earnings, member part-time wages, and unreimbursed moving expenses.

In the course of analyzing the data and writing this thesis, I have had a great deal of assistance and support from many people. I am particularly indebted to my thesis advisor, Dr. Leroy Gill, for his guidance and patience. I am also grateful to my fellow classmates, Captains Rod Troyanowski and Linda Lyons, for their help in writing working papers assisting in this research. Finally, I would like to thank my family, especially my wife Patti, for providing the inspiration and support I needed during this entire experience.

Stephen A. Giuliano

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Abstract

The purpose of this study was to examine the impact of permanent change of station (PCS) moves on the family income of Air Force enlisted personnel in Avionics and Non-avionics career fields. The research had four basic objectives: (1) Evaluate the effect of unreimbursed moving expenses on family income. (2) Determine the impact of PCS moves on spouse earnings. (3) Examine the effect of PCS moves on member part-time income. (4) Compare the effect of PCS moves on the family income of Avionics personnel to members in other career fields.

The study revealed that the average unreimbursed moving expenses for Air Force enlisted personnel ranges from \$1,100 to \$2,415 depending on the type of move.

The research also found two important effects of moving on spouse income and member part-time earnings. First, the expected income in both cases is generally lower during the year a family experiences a move as compared to the previous year. Additionally, moving more frequently during a typical 20 year career decreases the expected value of spouse income and member part-time income.

Finally, PCS moves were shown to have a similar impact on the family income of Avionics and Non-avionics personnel. For both groups, the expected family income is very close.

THE IMPACT OF PERMANENT CHANGE OF STATION MOVES  
ON AIR FORCE ENLISTED FAMILY INCOME  
FOR AVIONICS AND NON-AVIONICS PERSONNEL

I. Introduction

General Issue

During the current period of an all-volunteer force, the Armed Forces must be sensitive of the needs of its personnel to maintain a high quality, experienced military. Historically, these considerations have included such items as job satisfaction, pay and benefits, job security, and training/education. Recently, there has been considerable interest in the cost of permanent change of station (PCS) moves requiring relocation to a new area, and the impact of these moves on military families. If the anticipated high costs of PCS moves cause individuals to separate early, the Armed Forces loses valuable assets.

Specific Problem

By nature, military families tend to be much more mobile than their civilian counterparts. This study is an attempt to determine the manner in which PCS moves affect the family income of enlisted personnel in the United States Air Force. It will look at the impact of this increased mobility on the military family. Specifically, this research compares the

effects of frequent moves on personnel in the Avionics career field to personnel in other specialty codes. The data from the survey used for this research was not extensive enough to allow a comparison of all Air Force enlisted career fields. However, there were enough respondents in the Avionics specialty to compare the effect of PCS moves on the family income of these personnel to members in other career fields. This effort begins with a review of the direct costs incurred during PCS moves, concentrating on expenses not reimbursed by the government. These out of pocket expenses include outlays made before, during, and after the move. Additionally, this paper examines the indirect costs associated with a PCS move. This portion of the study focuses on the effect that increased mobility has on spouse employment and military members' part-time jobs. The desired end result is a projection of the impact of mobility on the family income of Air Force enlisted Avionics and Non-avionics personnel over a twenty year career.

#### Description of the Data

The primary data base for this study is the 1985 DoD Survey of Officer and Enlisted Personnel, prepared by the Research Triangle Institute. This survey was administered to almost 19,000 active-duty officers and more than 70,000 active-duty enlisted personnel in the Armed Forces (11:1). An additional source of information was the 1987 Air Force Military Personnel Center (AFMPC) PCS survey.

Certain assumptions were made to best capture the impact of interruptions on a wife's career. The sample set was restricted to male enlisted Air Force members married to a non-military spouse. The selected couples were all married within one year of the member entering the Air Force and married to the same spouse throughout the member's career. These limitations allow this study to focus on those wives attached to the military throughout their husband's career by discounting those wives who spent any part of this 20 year period in the civilian world.

#### Research Questions

In order to identify the manner in which PCS moves affect enlisted personnel family income for Avionics and Non-avionics personnel, data must be collected to answer the following research questions:

1. To what extent does mobility and the resulting unreimbursed moving expenses affect family income?
2. How important is the effect of PCS moves on spouse income?
  - a. What is the impact of mobility on the probability of a spouse working?
  - b. What is the impact of mobility on the probability of a spouse working full-time versus part-time?
  - c. What is the impact of mobility on a spouse's earnings?

3. How important is the effect of PCS moves on military members' part-time income?

- a. What is the impact of mobility on the probability of a military member working part-time?
- b. What is the impact of mobility on a military member's part-time income?

4. How does the impact of PCS moves affect Air Force enlisted personnel in Avionics or other specialties?

#### Background

Until recent times, Air Force wives were more likely to engage in volunteer work and less inclined to be active participants in the labor market. However, during the 1970s the labor force participation of all women, including military wives, increased. According to Mary Corcoran, Greg J. Duncan, and Michael Ponza:

Women are a vital part of today's labor force, and work is clearly an important part of their lives. Women comprised more than two-fifths of the labor force in 1978, and almost 60 percent of women aged 18 to 64 years were employed in 1978. [1:249]

Despite the large increase in the number of working military wives, when compared to women of similar ages "the labor force participation rate of military wives was nearly 14% less in 1984" (3:4).

The surge of women participating in the labor force has generated considerable literature on the economic aspects of female employment. Studies have shown that women tend to have different work participation patterns than men--they

generally have more career interruptions "to accommodate family and child-rearing duties" (1:249). As a consequence of these increased career interruptions, women in the work force are confronted with lower wages resulting from this intermittent work pattern and a lack of lack of human capital investment--there is less incentive for employers and employees to pursue training because of the shorter horizon over which the dividends will be reaped (2:386).

The obstacles facing military wives are even more intensified. First, the wives are often placed in a head of household capacity while their husbands are assigned to remote locations or on temporary duty for extended periods, thus limiting their potential for employment (7:61). Additionally, military families tend to have more children, contributing to a reduced military wives' labor force participation rate, especially in the case of preschool children (7:63). Finally, the frequent moves made by military families severely impact military wives' employment opportunities. More military wives occupy service and sales jobs than civilian wives, since these jobs offer the flexibility of part-time employment and require limited training. As expected, these jobs are typified by lower earnings (8:32). Additionally, these employment interruptions prevent military wives from obtaining specialized training and tenure, causing the wives to start over at entry level positions after each move (7:62).

Finally, military wives face the prospect of looking for jobs in unfamiliar locations and outright job discrimination by employers leery of what they consider short-term employees (8:33).

The first step in the study of the impact of PCS moves is a review of the literature. Extensive research has identified several effects of interruptions on employee earnings. The next chapter begins with a review of the consequences of mobility. It also contains a comparison of members in the Avionics career field to other specialties in areas including annual military income, annual spouse earnings, and annual member part-time income. Chapter 3 begins the examination of the direct costs associated with PCS moves by describing the components making up unreimbursed expenses for three types of moves (Overseas - CONUS, CONUS - CONUS, and CONUS - Overseas). The fourth chapter outlines the methodology used to arrive at the expected value of the spouse's income, member's part-time earnings, and member's military pay over a 20 year career. This methodology includes the calculations used to determine the various probabilities of working and the wage equation used to determine these 20 year income streams. Chapter 5, presents the final computations of the impact of mobility on family income. It includes present value annuities to compare the effects on members in the Avionics specialty codes against

other career fields. Finally, Chapter 6 summarizes this research effort and offers further recommendations for continued study in this area.

## II. Mobility and Family Income

### Impact of Mobility

Since the early 1970s there has been a surge of military wives entering the labor market. Comparatively lower military wages and changes in attitudes toward working wives have resulted in increased participation to the point where the labor force participation rate of military wives approximates that of their civilian counterparts. Despite closing the gap in employment opportunities, military wives still face many hardships not encountered by wives of civilians. The most significant difference is the increased frequency of moves made by military families. The 1985 DoD Survey of Officer and Enlisted Personnel revealed that approximately 45% of the military families had moved during the year preceding the survey (3:2). "In contrast, only 18.6% of the employed civilian labor force made any move (local or otherwise) during 1984" (3:2). Figure 1 shows the frequency of moves experienced by enlisted families where the member has served approximately 20 years. As depicted, most families moved 6 times over the length of a typical career. In fact, over 30 percent of the families whose husbands are in the Avionics career field moved 6 times. Additionally, over 10% of the families from the Avionics specialty and greater than 8% of the remaining families moved 9 or more times over the time period.

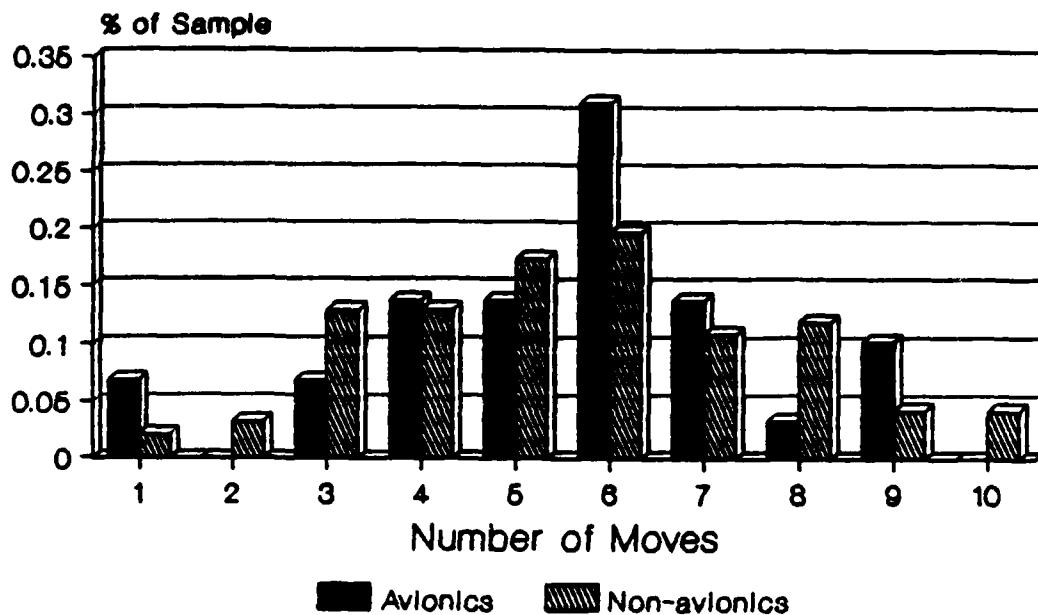


Figure 1. Frequency of Moves for a 20 Year Career

This increased mobility of military families has several repercussions for the working spouse. Mincer and Ofek noted that interruptions of a work career have an adverse impact on tenure and tend to lower wage earnings (12:11). These findings were echoed by Donald Cox, who wrote "women who experience a career interruption (either past or future) have earnings which are uniformly lower than those of continuous workers" (2:388). Since military wives move more often, they face more career interruptions. As a result, they encounter more frequent breaks in employment, less opportunities for training, higher unemployment, and lower earnings than their civilian counterparts.

On the average, Air Force enlisted wives change locations and jobs approximately every 4 years. These

frequent reassessments hamper their chances for increased training and tenure, key ingredients for increased wages. In fact, many wives find they must start over at entry level jobs at each new location (7:62). Howard Hayge states:

It has long been known that high mobility means frequent breaks in the wife's employment or education and training. One result is that her opportunities to develop a marketable career are disrupted; another is that she must search for jobs in unfamiliar geographic areas. [8:33]

Table 1 below shows the percentage of Air Force enlisted

Table 1

Percentage of Working Spouses for Enlisted Personnel

<u>Years of Service</u>	<u>Avionics</u>	<u>Non-avionics</u>
< 4	35%	45%
5 - 8	38%	46%
9 - 12	42%	49%
13 - 16	41%	51%
17 - 20	53%	58%
> 20	53%	68%

working wives. Remember, this sample set is restricted to non-military wives married within one year of the husband joining the Air Force and still married to the same spouse. As the table shows, a significant number of spouses are employed, and the percentages generally increase with more years of service. It is interesting to note here that wives with husbands in non-Avionics career fields are more likely to work than their counterparts.

Another result of the increased mobility is a higher unemployment rate for military wives. In 1986, "unemployment rates were higher across the board for military wives than for the other wives--10.7 versus 6.0 percent" (8:32). One final effect of mobility to consider is its impact on military wives' wages. Military wives are more likely to seek employment in sales and service occupation--about 35 percent held such jobs in 1986 compared to 27 percent of civilian wives (8:32). These type jobs "offer the flexibility of part-time employment, do not necessarily require specialized training, and are often typified by high employee turnover" (8:32). Tables 2 and 3 stress the fact that military wives are more likely to work part-time. These two tables show the percentage of Air Force enlisted wives working full-time and part-time respectively. Generally, the number of wives from the sample set working part-time is close to or greater than the number of wives working full-

Table 2

Percentage of Full-time Working Spouses  
for Enlisted Personnel

<u>Years of Service</u>	<u>Avionics</u>	<u>Non-avionics</u>
< 4	22%	27%
5 - 8	21%	27%
9 - 12	20%	23%
13 - 16	24%	32%
17 - 20	25%	30%
> 20	29%	45%

Table 3  
Percentage of Part-time Working Spouses  
for Enlisted Personnel

<u>Years of Service</u>	<u>Avionics</u>	<u>Non-avionics</u>
< 4	16%	19%
5 - 8	17%	20%
9 - 12	22%	27%
13 - 16	20%	23%
17 - 20	28%	30%
> 20	24%	24%

time. These part-time jobs are characterized by lower wages and thus decrease the amount of money the wife contributes to the family income.

What is the importance of the impact of mobility on spouse income? Women make up an important segment of today's labor force, and their earnings are often an important input into a family's total income (1:249). This is especially true for military families. Because military wages tend to be relatively low, working military wives "contribute a larger proportion of their families income than do their civilian counterparts" (7:62). As shown in Table 4, the

Table 4  
Annual Spouse Income for Enlisted Personnel (\$)

<u>Years of Service</u>	<u>Avionics</u>	<u>Non-avionics</u>
< 4	8,104	10,161
5 - 8	13,181	13,051
9 - 12	11,215	14,790
13 - 16	13,031	14,820
17 - 20	12,637	18,413
> 20	13,736	18,355

amount of annual spouse income for Air Force enlisted families is indeed substantial. It is also important to note here that the annual spouse income for wives of Non-avionics members is generally higher than that of the Avionics wives.

Comparing the total spouse income from the previous table to Table 5 below shows just how important a contribution the wives make to family income. Annual spouse income ranges from approximately 50 to 80 percent of the member's annual military income.

Table 5  
Annual Military Income for Enlisted Personnel (\$)

<u>Years of Service</u>	<u>Avionics</u>	<u>Non-avionics</u>
< 4	14,481	14,124
5 - 8	18,835	17,595
9 - 12	20,106	19,872
13 - 16	22,555	22,338
17 - 20	25,111	25,325
> 20	29,138	29,826

As mentioned and shown earlier, Air Force enlisted wives are more likely to seek work in occupations typified by part-time employment. Tables 6 and 7 demonstrate the drastic impact part-time employment has on spouse income. Table 6 lists the annual full-time income for Air Force enlisted wives. It is readily apparent that these full-time wages make up the majority of total spouse income.

Table 6

Annual Spouse Full-time Income for Enlisted Personnel (\$)

<u>Years of Service</u>	<u>Avionics</u>	<u>Non-avionics</u>
< 4	6,260	7,326
5 - 8	11,046	9,236
9 - 12	7,731	9,287
13 - 16	9,466	9,217
17 - 20	9,866	11,925
> 20	5,824	10,012

Table 7 shows the relatively smaller annual income for wives working part-time. These dollar amounts re-emphasize

Table 7

Annual Spouse Part-time Income for Enlisted Personnel (\$)

<u>Years of Service</u>	<u>Avionics</u>	<u>Non-avionics</u>
< 4	1,844	2,835
5 - 8	2,135	3,815
9 - 12	3,484	5,503
13 - 16	3,566	5,603
17 - 20	2,771	6,488
> 20	7,912	8,343

the points that not only are military wives accepting a large proportion of part-time jobs, their contributions to total family income is reduced as well.

In summary, the difficulties facing the working military wife may have a substantial economic impact on their families. This in turn can lead to retention problems, causing the Air Force to lose valuable assets (8:31).

The first part of this chapter concentrated on the impact of mobility on spouse income. It was shown that the working wives do indeed contribute a significant share of the total family income. Another element of total income is the amount of part-time earnings generated by the military member. Table 8 shows the percentage of part-time workers among Air Force enlisted personnel. As anticipated, the percentage of military members working an additional job is much lower than the percentage of wives participating in the labor force.

Table 8

Percentage of Part-time Workers for Enlisted Personnel

<u>Years of Service</u>	<u>Avionics</u>	<u>Non-avionics</u>
< 4	7.84%	10.22%
5 - 8	11.49%	10.68%
9 - 12	5.08%	11.62%
13 - 16	12.20%	10.78%
17 - 20	7.55%	14.16%
> 20	5.88%	5.33%

Table 9 shows the annual off-duty earnings claimed by Air Force enlisted members. As can be expected, enlisted personnel working off-duty are limited to part-time jobs, usually at lower wages. Although the earnings are not as substantial as the wives' income, they are still an important part of the total family income.

Table 9

## Annual Off-duty Part-time Income for Enlisted Personnel (\$)

<u>Years of Service</u>	<u>Avionics</u>	<u>Non-avionics</u>
< 4	1,125	1,747
5 - 8	2,167	2,530
9 - 12	2,333	2,349
13 - 16	2,478	2,763
17 - 20	5,288	4,815
> 20	560	3,870

Description of the Data

As stated previously, the primary sources of data for this study include the 1985 DoD Survey of Officers and Enlisted Personnel and the 1987 Air Force Military Personnel Center PCS Survey. A sample set was drawn from the data base using the following restrictions: male enlisted Air Force members married to a non-military spouse; couple married within one year of the military member entering the Service; and couple married only to one another throughout the member's career. These assumptions were used to more accurately capture the effects of interruptions on the wife's career.

The focus of this study is the impact of PCS moves on Air Force enlisted family income, specifically for personnel in the Avionics career field versus members in other specialty codes. This research into the effect of PCS moves on family income includes an examination of the impact of mobility on spouse income and member's part-time income, unreimbursed moving expenses, and total family income.

Thus far, the indirect costs associated with PCS moves have been discussed. The consequences of mobility and its impact on spouse earnings was described in the earlier portions of this chapter. The added component of military member part-time income was examined above. The next section, Chapter 3, evaluates the final element of the costs incurred during PCS moves. These are the direct costs, or unreimbursed expenses.

### III. Unreimbursed Moving Expenses

#### Description of the Data

As stated in Chapter 1, this research is focused on three specific areas to evaluate the impact of PCS moves on total family income: spouse earnings, military member part-time income, and out of pocket costs incurred when Air Force enlisted personnel are transferred. The primary source of data for this chapter is a 1987 PCS Survey conducted by the Air Force Military Personnel Center. The resulting information is based on the replies of over 1,500 Air Force enlisted respondents, all of whom made a PCS move in the year preceding the survey.

The purpose of this chapter is to calculate the average unreimbursed moving expenses for Air Force enlisted families. The methodology and computations used in this chapter were derived from a working paper by Giuliano, Lyons, and Troyanowski (4, see footnote). For this research, the costs associated with buying and selling houses were omitted. It is understood that housing costs play a key role during a

---

These authors have studied various aspects of military mobility as it affects the income of different groups. See Lyons' thesis [The Impact of Permanent Change of Station Moves on the Family Income of Rated and Nonrated Air Force Officers] and Troyanowski's thesis [The Effect on Family Income of Varying the Frequency of Permanent Change of Station Moves]. Their joint working paper developed a methodology and results which were applicable to each author's separate research.

family move. However, the assumption here is that housing costs are more of an investment or transfer of assets than an unreimbursed cost of moving. This chapter will present the average out of pocket expenses for three different types of move: CONUS to overseas, CONUS to CONUS, and overseas to CONUS.

#### Out of Pocket Expenses

Using the 1987 PCS Survey, it was determined that out of pocket expenses (OOP) equals the sum of total move (TM) costs plus automobile expenses (AE) less reimbursements (REIM) from the government for moving. The "TM" costs consist of before move (BM), during move (DM), and after move (AM) expenses. The upcoming sections of this chapter describe these elements of out of pocket expenses in more detail.

Before Move Costs. The before move costs contain expenses incurred up to the date departed the old duty station. As described by the 1987 PCS Survey, these costs include:

- a. Moving-out expenses (house/apartment cleaning, painting, lawn, landscaping, etc.), not to include preparation or marketing of home for sale or rent
- b. Deposits lost on rental housing due to breaking rental lease (do not include withheld deposits due to damages, wear & tear, missed rent payments, etc.)
- c. Cost of temporary lodging from date of packing household goods to date departed old duty station
- d. Cost of meals from date of packing household goods to date departed old duty station

- e. Mobile home preparation
- f. Pet care from date of packing household goods to date departed old duty station (boarding, cages, shipping containers, shots, not including food)
- g. Child care from date of packing household goods to date departed old duty station
- h. Preparation and shipment of household goods articles not shipped by the government (household goods in excess of prescribed weight allowances or items you wanted to handle yourself)
- i. Additional insurance for household goods coverage during move
- j. Car rental fees from date of packing household goods to date departed old duty station
- k. Special items purchased due to climate of or conditions in new locations (voltage converters, hot/cold weather clothing, snow tires, etc.)
- l. Rental of vehicles or equipment for Do-it-Yourself (DITY) move (trailer, vehicles, hitches, dollies, hand carts, boxes, etc.)
- m. Miscellaneous expenses (loss of perishable food items, items discarded due to nonshipment by the government, telephone disconnect charges, change of address notifications, increase in auto insurance, etc.) [6:5]

Certain adjustments were made to these before move costs to make them more accurate. The cost of temporary lodging was reduced by the average amount of the member's Basic Allowance for Quarters (BAQ) for the specified time period. This adjustment was made since military personnel continue to receive their BAQ during a PCS move. A similar correction was made to the cost of meals to account for the member continuing to receive a Basic Allowance for Subsistence. In

both cases the amount of BAQ/BAS deducted was prorated based on the average number of days in the before move period.

During Move Costs. As described by the survey, the costs incurred between departing the old duty station and arriving at the new duty station are as follows:

- a. Cost of temporary lodging from date departed old duty station to date arrived at new duty station
- b. Cost of meals from date departed old duty station to date arrived at new duty station
- c. Toll fees
- d. Gasoline and oil (including costs of all automobiles driven)
- e. Transportation costs other than for car (bus, train, plane, cab, etc.)
- f. Car rental fees from date departed old duty station to date arrived at new duty station
- g. Pet travel expenses, excluding food
- h. Out-of-pocket mobile home transportation costs (on-the-road maintenance, etc.)
- i. Miscellaneous expenses [6:6]

The during move costs associated with temporary lodging and meals were corrected in the same manner as above. However, the average time period spent in the during move status could not be determined from the survey data. An assumption of 4 days as the average amount of authorized travel time was used in the calculations to adjust the lodging and meal expenses.

After Move Costs. The final component comprising the total move costs, after move expenses, includes the following outlays incurred after arriving at the new duty station:

- a. Cost of temporary lodging from date arrived new duty station to date household goods were delivered to new residence
- b. Cost of meals from date arrived new duty station to date household goods were delivered to new permanent residence
- c. Travel in vicinity of the new station to look for a new residence
- d. Moving-in expenses (curtains, carpets, painting, lawn, landscaping, utility hook-up, etc., not including rent or security deposits)
- e. Damaged or lost household goods shipped by government
- f. Damages caused by shipment/loss of household goods articles not shipped by government
- g. Mobile home set-up
- h. Pet care from date of arrival at new duty station to date household goods were delivered to new permanent residence
- i. Miscellaneous expenses [6:6]

The after move temporary lodging and meal expenses were reduced using the same procedure employed for the before move costs, since the time spent in the after move category was attainable from the survey information.

Automobile Expenses. This final category of moving expenses consists primarily of the costs involved to prepare an automobile for a long trip and the expenses facing a member moving to or from overseas. The following elements, as described by the 1987 PCS Survey, outline the costs included in this category:

- a. If you moved a vehicle to or from overseas at personal expense, other than the one mentioned in question 52, what were the total costs?

- b. Cost of maintenance performed on automobile(s) to make road-worthy for long trip
- c. Cost of special handling devices for automobile(s) (tow bar, trailer hitch, etc.) NOTE: Include preparation costs for overseas, such as removal of high value items, modification of fuel exhaust system, etc.
- d. Cost to deliver car(s) to port (gas, oil, toll fees, meals, lodging, return to old station, etc.)
- e. Cost to pick up car(s) from port (travel to port, lodging, gas, oil, toll fees, etc.)
- f. If you stored an automobile, what was the total cost, to include delivering the automobile(s) to the designated location (gasoline, lodging, meals, storage, etc.)? [6:8]

Because of their nature, items a, d, e, and f are only included in the automobile expenses for a move to or from an overseas location.

Reimbursements. The final dollar amounts needed to calculate the average out of pocket moving expenses are those making up reimbursements. This is the money paid to the military member to help defray the various costs of moving. From the survey, the following items make up these reimbursements:

- a. Member travel
- b. Dependent travel
- c. Dislocation allowance (equivalent to one month's basic allowance for quarters at the "with" or "without dependent" rate)
- d. Funds received for a "Do-it-Yourself" (DITY) move
- e. Mobile home allowance
- f. Damaged household goods claimed, received, or expected to claim and receive

g. Temporary Lodging Expense (TLE) Allowance (E-4 and below with dependents) [6:11]

Results

To arrive at an average unreimbursed moving expense for Air Force enlisted families, the total move costs (BM, DM, and AM) are added to the automobile expenses and then reduced by the amount of reimbursements. Table 10 below shows the average amount of out of pocket moving expenses for three different types of moves. A fourth category of moves, overseas to overseas, was not included because the sample size was very limited. As might be expected, a move to or from overseas proved more costly than a CONUS to CONUS move.

Table 10

Average Out of Pocket Moving Expenses  
for Air Force Enlisted Personnel (\$)

	<u>CONUS-O/S</u>	<u>CONUS-CONUS</u>	<u>O/S-CONUS</u>
Before Move	912.27	785.00	1,052.70
During Move	616.98	474.37	874.63
After Move	1,159.46	979.15	1,524.92
Auto Expenses	291.16	143.72	323.34
Total Costs	2,979.87	2,382.24	3,775.59
Reimbursements	1,034.10	1,219.47	1,360.22
Out of Pocket Expenses	1,945.77	1,162.77	2,415.37

These out of pocket costs incurred because of a reassignment are a consequence of being a member of the Air Force. The mean values shown in Table 10 will be used later in this research as part of the calculations to determine the

expected value of a family's total income over a 20 year career. The methodology used to determine these expected values, including the computations of the probabilities of working and the wage equations, will be discussed in the next chapter.

#### IV. Methodology

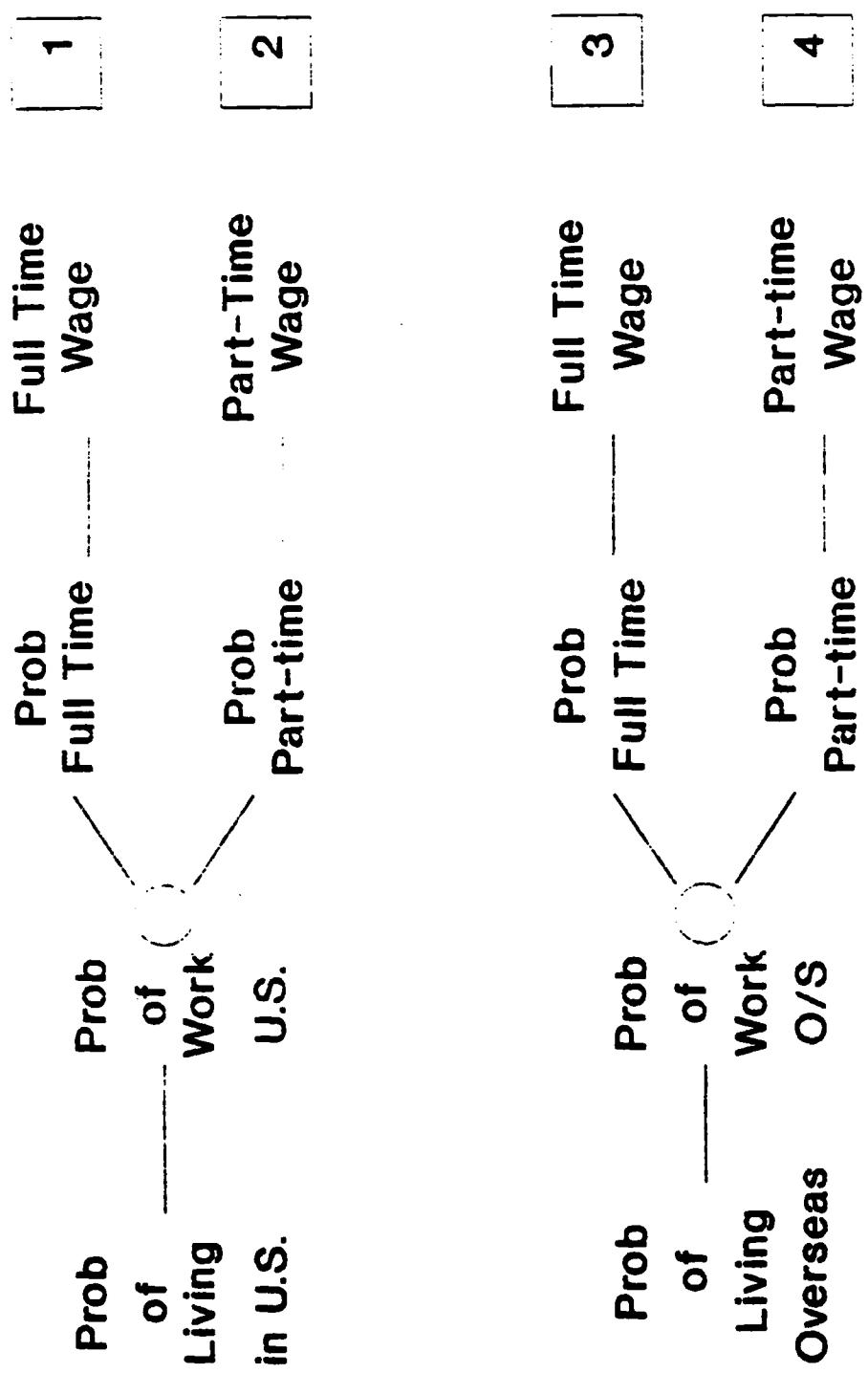
##### Introduction

The previous chapter discussed the unreimbursed costs associated with PCS moves. These out of pocket expenses directly impact a family's total income each time a member relocates to a different area. This chapter will describe the methodology used to determine the impact of PCS moves on spouse earnings and member part-time income. The methodology and the probability equations described in this chapter were derived from a working paper by Giuliano, Lyons, and Troyanowski (5, see footnote). Figures 1 and 2 show diagrams representing the methodology followed to determine the expected values of spouse and member income.

As can be seen in Figure 2, the expected value of spouse income for each year is equal to the expected value of CONUS income added to the expected value of overseas income. The expected value of spouse CONUS income, indicated by the top two branches, is found by multiplying the probability of the wife working in the CONUS times the probability of the wife

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These authors have studied various aspects of military mobility as it affects the income of different groups. See Lyons' thesis [The Impact of Permanent Change of Station Moves on the Family Incomes of Rated and Nonrated Air Force Officers] and Troyanowski's thesis [The Effect on Family Income of Varying the Frequency of Permanent Change of Station Moves]. This joint working paper developed estimating equations and other results which were applicable to each author's separate research.

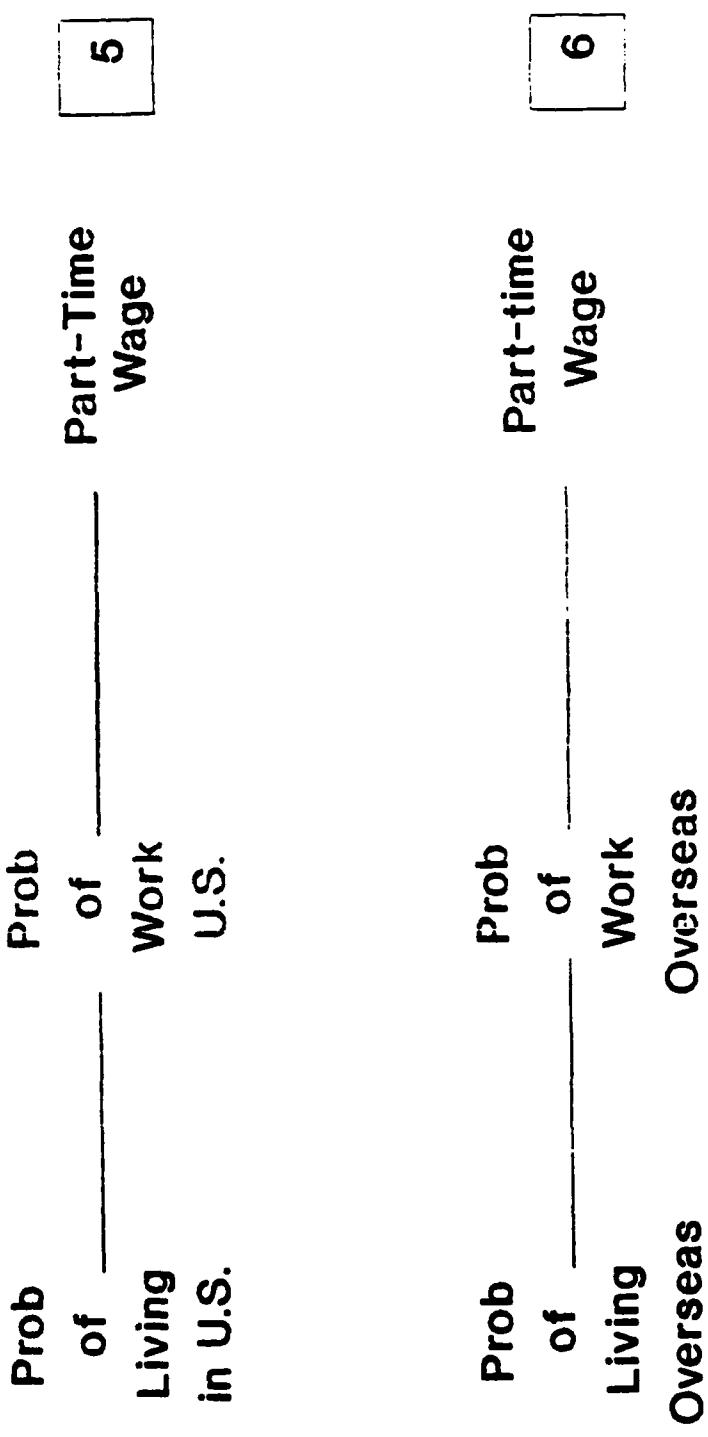


**Expected Value of Wife's Income = 1 + 2 + 3 + 4**

**Figure 2. Expected Value: Wife's Income for a Given Year**

working full-time in the CONUS times the wife's full-time CONUS income, and adding this figure to the product of the probability of the wife working in the CONUS times her probability of working part-time in the CONUS times her annual part-time earnings. This procedure is then repeated using overseas data to determine the expected value of overseas income (branches 3 and 4). Before these two formulas can be added together, a weighted factor representing the average proportion of time a wife spends in the CONUS and overseas over a 20 year career must be applied to the respective equations. Finally, the expected value of the wife's income is estimated by adding the expected value of CONUS and overseas income together.

The methodology depicted in Figure 3 for the expected value of the member's part-time income is less complex. Since the member already has a full-time military career, any additional work is considered part-time. Therefore, the probability of the member working full-time versus part-time is not required in this equation. Instead, the expected value of the member's part-time income is equal to the probability of the member working an additional job in the CONUS times the member's part-time CONUS earnings (branch 5) plus the probability of the member working overseas times his overseas earnings (branch 6). Once again, before the branches are added together, they are multiplied by weighted factors depicting the mean percentage of time a member spends



**Expected Value of Member's Second Job Income = 5 + 6**

**Figure 3. Expected Value: Member's Second Job Income for a Given Year**

in the CONUS and overseas during a typical career. Once the branches have been weighted appropriately, they are added together to determine the expected value of member part-time income.

Chapter 4 is presented in three major sections. The first section will explain the methodology followed to determine the expected value of earnings by Air Force enlisted wives of Avionics and Non-avionics specialists. These expected earnings will be displayed for five different scenarios to reflect the effect of moving on spouse earnings. Each scenario shows the expected annual income for the spouse over a 20 year time period (the length of a typical military career) for a specified number of PCS moves. The second part of this chapter describes the methodology used to arrive at the expected value of part-time income earned by Air Force enlisted personnel. Similar to the expected spouse income mentioned above, this section contains tables showing the expected annual part-time income over a 20 year career. The data in these tables is also presented for a varied number of PCS moves made by the spouse over this time period (see footnote). This chapter concludes by tracing the methodology followed to estimate the expected value of the member's military income for Avionics and Non-avionics

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Military members sometimes move without their wives. For Air Force enlisted personnel the ratio of military moves to spouse moves is 1.192:1.

specialties. This procedure will yield a table displaying the expected military income for both categories by year over a 20 year period. Once the expected values for spouse, part-time, and military income are attained, the total impact of PCS moves on family income can be examined in Chapter 5.

#### Expected Value of Spouse Income

The first part of this chapter focuses on the determination of expected values of spouse income over a 20 year time period. The expected value of spouse income for each year is composed of two major elements: the expected value of CONUS income and the expected value of overseas income. The procedure used to calculate the expected values of CONUS and overseas income as shown in Figure 2 was described above.

The upcoming sections describe the methodology used to determine the different variables identified in Figure 2 to calculate the expected values of spouse income. The sections are presented in an order similar to how they appear in the diagram, beginning with the average proportion of time the wife spends in the CONUS.

Spouse Average Time in the CONUS. The first ingredient needed to determine the expected value of the wife's income is the percentage of time the spouse spends in the CONUS over a 20 year period. These percentages were attained by finding the actual mean time spent in the CONUS for wives in the twentieth year of their career. These figures, .804123 for

wives of Avionics personnel and .837391 for others, suggest that wives spend just over 80% of their time in the CONUS.

Probability of the Spouse Working - CONUS. The next element listed in Figure 2 is the probability of the wife working in the CONUS. As seen in the diagram, this estimated probability will impact the expected values of full-time (branch 1) and part-time (branch 2) earnings.

The following equation was used to determine the probabilities associated with the wife working (10:25):

$$P_i = \exp(B'X)/[1 + \exp(B'X)] \quad (1)$$

where  $B'$  represents a vector of the parameter estimates used in the equation and  $X$  denotes the input values associated with each parameter.

Parameter Estimates. Since the probability of a wife working or not working results in a binary dependent variable (1 is the wife works and 0 if she does not), problems are encountered with heteroscedasticity and the residuals not being normally distributed. Therefore, the procedure used here transforms the equation so that the error terms follow the logistics distribution (10:15-16). The maximum likelihood method was then used to estimate the equation explaining the likelihood of a wife working in the CONUS shown in Table 11. A listing of the variables and definitions used throughout this chapter is contained in Appendix A. The parameter estimates for "SAGE" (spouse age), "SSCHOOL" (number of years of schooling for the spouse),

Table 11  
 Equation for the Likelihood of an  
 Air Force Enlisted Wife Working - CONUS

<u>Variable</u>	<u>Parameter Estimate</u>	<u>Chi-Square</u>	<u>Prob</u>
INTERCEPT	-3.34933	205.14	.0001
SAGE	.04876	82.22	.0001
SSCHOOL	.15803	154.99	.0001
OVERSEAS	.03155	9.39	.0022
SBOONIES	-.24862	10.21	.0014
BLACK	.40473	11.29	.0008
SMONTHS	.01538	163.27	.0001
MTOTDEBT	.17551	151.85	.0001
LESS15	-.26053	38.34	.0001
HUSBAND	-.37836	14.87	.0001
KIDS	-.15170	12.65	.0004
MILINC	-.00003	109.96	.0001
MCIVERNS	.00002	3.40	.0654
MNONWAGE	9.8E-7	.03	.8533

"SMONTHS" (number of months the spouse has been at the present location), and "MTOTDEBT" (total family debt) are very significant and the positive signs of the coefficients indicate that the wife's likelihood of working in the CONUS is greater as these variables increase. As might be expected, wives with children at home (KIDS), especially children under the age of 15 (LESS15) are less likely to work. "OVERSEAS" (the number of months the spouse has spent overseas) has a positive sign and is significant, showing it is positively correlated to the likelihood of the wife working for this equation. "SBOONIES" is a subjective variable indicating limited labor market opportunities resulting from living in less populated locations, and has a negative sign as expected. The race variable for black wives

has a positive coefficient and is significant here. The negative and significant coefficient for "HUSBAND" implies that the wife is less likely to work if her husband is at her present location. The variable "MILINC", also negative and significant, suggests that an increase in the husband's military earnings decreases the likelihood of the wife working. "MCIVERNS", the amount of the military member's part-time income, has a positive coefficient and is very significant. Finally, "MNONTWAGE" (a measure of the family's income from other sources) is insignificant for this equation.

Input Values for the Variables. The next step in determining the probability of the wife working in the CONUS is to determine values for the variables found in the previously described equation. The key variable in this section is "SMONTHS" (number of months the spouse has been at her present location), since this research is focusing on the impact of PCS moves on family income. Therefore, the values for "SMONTHS" have been varied to address five different scenarios. These five situations result from varying the number of PCS moves made by the family, ranging from 5 to 9 over a 20 year career. Table 12 shows the values for "SMONTHS" for each of the five possibilities. These numbers indicate the number of months the wife has been at her present location for any particular year, depending on the expected number of PCS moves over the 20 year period. For

Table 12  
Number of Months for the Spouse  
at the Present Location

<u>Year</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	6	6	6	6	6
2	18	18	18	18	18
3	30	30	25.17	15	9.75
4	42	15.33	8	12	15
5	6	14	20	24	11.83
6	18	26	3.75	6	13
7	30	24.67	9	18	16
8	42	10	21	15	10
9	6	22	18.83	12	19.75
10	18	34	11	24	7
11	30	6	23	6	19
12	42	18	15.58	18	7.17
13	6	30	13	15	17
14	18	15.33	25	12	11
15	30	14	13.67	24	14
16	42	26	14	6	14.75
17	6	24.67	26	18	11
18	18	10	9.83	15	16.50
19	30	22	16	12	9
20	42	34	28	24	21

example, in year of the first category, 5 PCS moves, the value is 6 months. This number can be easily verified. A family making 5 PCS moves over a 20 year career will average a move every 4 years (48 months). Counting the first year as the first move, and then using the midpoint of the first year and adding 48 months results in the family making their next move halfway through the fifth year. Therefore, for year 5 a spouse will have spent 6 months at the new location. This same procedure was used to attain the rest of the values.

The remaining input values for the variables are shown in Appendix B. These figures are listed for personnel in the

Avionics career field and members in other specialty codes. As seen the these tables, some of the inputs are constant while others vary over the 20 year period. "SSCHOOL" is a constant number representing the spouse's average number of years of schooling at the time their husband entered the Air Force. The constant values for "BLACK" and "HUSBAND" denote the means of these two variables. "SAGE" indicates the wife's average age when her husband entered the Air Force and increases by one for each subsequent year. The input values for the remaining variables (MNONWAGE, MTOTDEBT, MILINC, KIDS, LESS15, MCIVERNS, SBOONIES, and OVERSEAS) depict the means by year over a typical career.

Calculated Probabilities. The probability of the wife working in the CONUS can now be calculated using the formula described earlier in this section. Table 13, parts A and B, shows these probabilities for both Avionics and Non-avionics personnel. These probabilities are presented for the five scenarios discussed previously for each year in a typical career. The noticeable increase in the probabilities of the wife working in year 20 for Avionics personnel seems to be the result of a larger total family debt, increased time at the present location, and fewer children (especially those under the age of 15) in the home. Despite the large increase in the last year, the average probabilities for both categories are very close. Examination of the tables shows the direct impact of a PCS move on the wife's probability of

Table 13

## Part A - Avionics

## Probability of Spouse Working in the CONUS

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.355	.355	.355	.355	.355
2	.419	.419	.419	.419	.419
3	.492	.492	.474	.435	.415
4	.505	.404	.377	.391	.402
5	.383	.413	.435	.451	.405
6	.405	.435	.354	.362	.387
7	.459	.439	.381	.414	.406
8	.487	.368	.408	.386	.368
9	.280	.332	.321	.299	.324
10	.394	.454	.369	.416	.354
11	.458	.369	.431	.369	.416
12	.488	.397	.388	.397	.358
13	.389	.480	.415	.423	.430
14	.373	.363	.398	.351	.348
15	.463	.402	.401	.440	.402
16	.532	.471	.425	.395	.428
17	.436	.507	.512	.481	.455
18	.410	.381	.380	.399	.405
19	.494	.463	.440	.425	.414
20	.698	.671	.650	.636	.626
Average	.446	.431	.417	.412	.406

working in the CONUS. For example, in the column listing the probabilities based on 5 PCS moves, the calculated probabilities for the year of each move (years 5, 9, 13, and 17) are significantly lower than for the year immediately preceding the move. Additionally, a closer look at the tables reveals the net impact of more frequent moves on the average probability of the wife working. Overall, increasing the number of PCS moves reduces the probability of the wife working.

Table 13 (continued)

## Part B - Non-avionics

## Probability of Spouse Working in the CONUS

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.354	.354	.354	.354	.354
2	.430	.430	.430	.430	.430
3	.473	.473	.455	.417	.397
4	.510	.408	.381	.396	.407
5	.379	.408	.431	.446	.400
6	.432	.462	.379	.387	.413
7	.457	.437	.379	.412	.404
8	.498	.378	.418	.396	.378
9	.348	.406	.394	.369	.397
10	.424	.485	.398	.447	.383
11	.437	.350	.411	.350	.396
12	.488	.397	.389	.397	.358
13	.373	.462	.398	.406	.413
14	.446	.436	.473	.423	.419
15	.462	.402	.401	.439	.402
16	.512	.450	.405	.376	.408
17	.393	.463	.468	.437	.411
18	.481	.451	.450	.470	.476
19	.544	.513	.490	.474	.463
20	.555	.524	.501	.486	.474
Average	.450	.434	.420	.416	.409

Now that the probabilities of the wife working in the CONUS have been estimated, the next step is to determine the probability of the wife working full-time and part-time in the CONUS.

Probability of the Spouse Working Full-time - CONUS.

The methodology followed to determine the previous probabilities was used again to determine the probability of the wife working full-time in the CONUS. The only difference involved the computation of new parameter estimates.

Parameter Estimates. Table 14 below lists the parameter estimates for the likelihood of the wife working full-time in the CONUS equation. The variables "SAGE",

Table 14

Equation for the Likelihood of an Air Force Enlisted Wife Working Full-time - CONUS

<u>Variable</u>	<u>Parameter Estimate</u>	<u>Chi-Square</u>	<u>Prob</u>
INTERCEPT	-1.18109	13.06	.0003
SAGE	.03969	24.90	.0001
SSCHOOL	.05033	8.15	.0043
OVERSEAS	.00862	.43	.5100
SBOONIES	-.00758	.00	.9482
BLACK	.36970	5.52	.0188
SMONTHS	.00742	22.32	.0001
MTOTDEBT	.14396	49.09	.0001
LESS15	-.33828	32.43	.0001
HUSBAND	-.18089	2.02	.1548
KIDS	-.12827	4.35	.0676
MILINC	-.00004	52.58	.0001
MCIVERNS	-.00002	1.22	.2692
MNONWAGE	2.2E-6	.10	.7506

"SSCHOOL", "SMONTHS", and "MTOTDEBT" continue to have positive signs and are very significant. As was the case for the likelihood of the wife working in the CONUS, the coefficients for the variables involving children (KIDS and LESS15) are negative and significant. Additionally, the race variable (BLACK) and the amount of military earnings (MILINC) have the same signs as before and are still significant. However, the remaining variables (OVERSEAS, SBOONIES, HUSBAND, MCIVERNS, and MNONWAGE) have no significant impact on the likelihood of the wife working full-time in the CONUS.

Input Values for the Variables. The individual inputs for the specified variables are the same as those used previously. These values are presented in Appendix B.

Calculated Probabilities. To construct the tables showing the probabilities of the wife working full-time in the CONUS, the parameter estimates and input values described above were put into Equation 1. The resulting probabilities represented the probability of a wife working in the CONUS, given that the wife was working. By multiplying these probabilities by the probabilities of the wife working (Table 13) the probabilities of a wife working full-time in the CONUS was attained. Table 15 displays this data. As seen, the probabilities of the spouse of an Avionics member working full-time in the last year increases substantially. This is due to the higher probability of the wife working in this year, which was discussed earlier. A comparison of parts A and B of this table reveals very little difference in the probabilities for the two groups. Additionally, analysis of the table shows that the wife is generally less likely to work full-time during the year of a move. Finally, the data illustrates that wives making more PCS moves are more likely to work part-time than wives moving less frequently.

Table 15  
Part A - Avionics  
Probability of Spouse Working Full-time in the CONUS

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.187	.187	.187	.187	.187
2	.225	.225	.225	.225	.225
3	.291	.291	.276	.246	.230
4	.292	.214	.194	.205	.213
5	.192	.213	.230	.241	.207
6	.206	.228	.170	.176	.193
7	.244	.229	.188	.211	.206
8	.256	.171	.198	.183	.171
9	.107	.136	.130	.117	.131
10	.186	.228	.169	.201	.160
11	.230	.169	.211	.169	.201
12	.242	.180	.174	.180	.155
13	.189	.254	.207	.212	.217
14	.157	.152	.173	.145	.142
15	.235	.193	.192	.219	.193
16	.286	.239	.207	.186	.209
17	.224	.278	.282	.258	.238
18	.187	.168	.168	.180	.184
19	.263	.240	.223	.212	.204
20	.475	.448	.428	.414	.404
<b>Average</b>	<b>.234</b>	<b>.222</b>	<b>.216</b>	<b>.208</b>	<b>.204</b>

Table 15 (continued)

## Part B - Non-Avionics

## Probability of Spouse Working Full-time in the CONUS

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.176	.176	.176	.176	.176
2	.242	.242	.242	.242	.242
3	.276	.276	.261	.231	.216
4	.298	.219	.199	.210	.218
5	.197	.218	.235	.246	.212
6	.232	.256	.194	.200	.219
7	.249	.233	.191	.215	.209
8	.274	.185	.214	.198	.185
9	.159	.198	.190	.173	.192
10	.218	.264	.200	.235	.190
11	.217	.158	.198	.158	.188
12	.253	.189	.183	.189	.163
13	.177	.240	.194	.200	.205
14	.229	.221	.249	.212	.210
15	.236	.194	.193	.220	.194
16	.266	.220	.189	.170	.191
17	.185	.234	.237	.216	.197
18	.259	.236	.235	.250	.254
19	.311	.286	.267	.256	.247
20	.313	.288	.270	.258	.249
Average	.238	.227	.216	.213	.208

Probability of the Spouse Working Part-time - CONUS.

The probabilities of the wife working part-time in the CONUS, Table 16, were determined using information from the previous step. The probabilities of working wives working full-time, found using Equation 1, were subtracted from 1 to arrive at the probabilities of the wife working part-time (given that she is working). These values were multiplied by the probabilities of the wife working in the CONUS to estimate

Table 16  
Part A - Avionics  
Probability of Spouse Working Part-time in the CONUS

<u>Year</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.169	.169	.169	.169	.169
2	.194	.194	.194	.194	.194
3	.201	.201	.198	.189	.185
4	.213	.190	.182	.187	.190
5	.191	.200	.206	.209	.197
6	.199	.208	.183	.186	.194
7	.215	.210	.193	.203	.201
8	.232	.197	.210	.203	.197
9	.173	.196	.191	.182	.193
10	.208	.226	.199	.215	.194
11	.228	.200	.220	.200	.216
12	.246	.218	.214	.218	.203
13	.201	.226	.209	.211	.213
14	.215	.217	.225	.207	.205
15	.227	.210	.209	.221	.210
16	.246	.231	.218	.209	.220
17	.212	.229	.230	.223	.217
18	.223	.212	.212	.219	.221
19	.231	.224	.218	.213	.210
20	.229	.223	.223	.222	.222
Average	.212	.209	.205	.204	.202

the probabilities of a wife working part-time in the CONUS. Once again, the resulting probabilities are very similar for Avionics and Non-avionics personnel.

At this point, the only variables needed to complete the calculations of the expected value of the wife's CONUS income (branches 1 and 2 of Figure 1) are the full-time and part-time CONUS income. The approach used to find these elements is described in the next two sections.

Table 16 (continued)

## Part B - Non-Avionics

## Probability of Spouse Working Part-time in the CONUS

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.178	.178	.178	.178	.178
2	.188	.188	.188	.188	.188
3	.198	.198	.194	.186	.181
4	.212	.189	.182	.186	.189
5	.182	.190	.196	.199	.188
6	.199	.206	.185	.187	.194
7	.208	.203	.187	.197	.195
8	.224	.193	.205	.198	.193
9	.189	.208	.204	.196	.205
10	.206	.221	.198	.212	.194
11	.221	.192	.213	.192	.208
12	.235	.209	.206	.209	.195
13	.196	.222	.204	.206	.209
14	.217	.214	.224	.211	.210
15	.226	.208	.208	.220	.208
16	.246	.230	.216	.206	.217
17	.208	.229	.230	.222	.214
18	.222	.215	.215	.220	.221
19	.233	.227	.222	.219	.216
20	.242	.236	.231	.228	.225
Average	.211	.208	.204	.203	.201

Spouse Annual Full-time Income - CONUS. The equation used to estimate a spouse's full-time earnings in the CONUS was developed by Gill, Haurin, and Phillips (3:11).

Parameter Estimates. Table 17 below shows the variables and parameter estimates making up the equation. For this equation, the dependent variable is the log of the wife's full-time weekly wage. The coefficients for "AGE", "EDUCATION" (number of years of schooling), and "TENURE" are all positive and have a significant impact on the equation.

Table 17  
Equation for Wife's Full-time Weekly Wage

<u>Variable</u>	<u>Parameter Estimate</u>	<u>t</u>	<u>Prob</u>
INTERCEPT	3.90330	26.423	.0001
AGE	.02581	6.382	.0001
EDUCATION	.05714	7.586	.0001
TENURE	.00116	2.299	.0220
EDUC*SKILL	.01436	6.064	.0001
SOVERSEAS	-.01021	-1.318	.1882
BOONIES	-.04960	-1.005	.3154
BLACK	-.08724	-1.232	.2187
ASIAN	-.10159	-1.774	.0767
MILLS	.10001	1.814	.0704
WMOVES	-.02978	-3.139	.0018

The interaction variable (EDUC\*SKILL), which combines the education level with the respondent's assessment of how much her skills are needed for her job, is also positive and very significant. The race variable (BLACK) and the number of moves made by the wife (WMOVES) are negative and significant. "MILLS" is the self-selection bias correction term suggested by Heckman. Its significance implies that this bias may be a factor in estimating from this equation (9:153). Finally, the variables "SOVERSEAS" (amount of time the wife has spent overseas), "BOONIES" (limited labor opportunities resulting from living in less populated areas), and "BLACK" are all insignificant in estimating the wife's full-time weekly wage (3:11).

One change was made to the above equation for use in this research. The equation is designed to be individual specific. This research is using sample means to predict the

wife's income, but the means for "TENURE" cannot be used because this study is concentrating on the impact of PCS moves on family income. Generally, increasing the number of PCS moves decreases the amount of tenure. Therefore, a separate model was developed for the "TENURE" variable to allow the equation to capture the effect of increased mobility. Table 18 below shows this equation for estimating

Table 18

Equation for Estimating Tenure  
for Air Force Enlisted Wives

<u>Variable</u>	<u>Parameter Estimate</u>	<u>t</u>	<u>Prob</u>
INTERCEPT	-7.67528	-1.297	.2121
LT12	5.59675	.884	.3889
SMONTHS	.57858	3.049	.0073

"TENURE". The variable "LT12" is a dummy variable used to indicate wives married less than 12 months. The intent is to account for those cases where a military member married a woman from the local area whose job tenure perhaps exceeds the length of time they have been married. The coefficient for "SMONTHS" (number of months at present location) had the expected positive sign and was very significant.

Input Values for the Variables. Similar to the approach used for calculating the spouse probabilities of work, the next step is to determine input values for the above variables. Two key variables involved are "SMONTHS" (as used with TENURE) and "WMOVES", since both are directly

impacted by PCS moves. The input values for "SMONTHS" are exactly the same as those listed in Table 12. As mentioned above, "WMOVES" indicates the number of moves the wife has made. To be consistent with the previous sections, the moves. Table 19 shows the input values for "WMOVES" for each possibility. The figures shown depict the number of moves made by a wife at that point in her husband's career. For example, for year 4 in the column listing 6 PCS moves the stated value is 1.67. Since a family moving 6 times over a inputs for "WMOVES" was varied to reflect between 5 and 9 PCS

Table 19  
Number of Moves Made by Year  
by an Air Force Enlisted Wife

<u>Year</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	1	1	1	1	1
2	1	1	1	1	1
3	1	1	1.17	1.5	1.75
4	1	1.67	2	2	2
5	2	2	2	2	2.58
6	2	2	2.25	3	3
7	2	2.33	3	3	3.33
8	2	3	3	3.5	4
9	3	3	3.42	4	4.08
10	3	3	4	4	5
11	3	4	4	5	5
12	3	4	4.58	5	5.92
13	4	4	5	5.5	6
14	4	4.67	5	6	6.67
15	4	5	5.67	6	7
16	4	5	6	7	7.42
17	5	5.33	6	7	8
18	5	6	6.83	7.5	8.25
19	5	6	7	8	9
20	5	6	7	8	9

20 year career will change locations about every 3.33 years, at the end of the fourth year the wife will have made 1.67 moves. The remaining input values are listed in Appendix C. As can be seen, some of these figures are constants, while the others vary by year over the time period. Additionally, the mean values used for this equation are separated into the two categories for Avionics and Non-avionics personnel.

Calculated Full-time Income. As stated at the beginning of this section, the dependent variable of the equation is the log of the wife's full-time weekly wage. Table 20 shows the results of multiplying the antilog of the dependent variable by 52 (number of weeks in a year) to arrive at annual full-time incomes for wives in the CONUS. On the average, wives of Avionics specialists can expect to earn about \$600 more annually than their counterparts. When examining the results, the impact of PCS moves on "WMOVES" and "TENURE" becomes obvious. The annual income suffers not only in the year of a move, it is impacted by the number of moves made by the wife during the 20 year period.

Table 20  
Part A - Avionics  
Full-time Income for Air Force Enlisted Wives (\$)

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	8,870	8,870	8,870	8,870	8,870
2	9,186	9,186	9,186	9,186	9,186
3	9,768	9,768	9,688	9,527	9,423
4	9,953	9,585	9,443	9,469	9,487
5	9,629	9,681	9,720	9,746	9,500
6	9,723	9,776	9,559	9,362	9,407
7	10,363	10,224	9,919	9,979	9,867
8	10,470	9,947	10,020	9,833	9,655
9	10,323	10,435	10,284	10,061	10,088
10	10,561	10,675	10,203	10,292	9,877
11	10,930	10,439	10,559	10,133	10,222
12	11,312	10,804	10,601	10,487	10,131
13	10,870	11,047	10,601	10,459	10,318
14	11,718	11,467	11,428	10,996	10,773
15	11,653	11,191	10,968	10,936	10,544
16	11,964	11,489	11,062	10,680	10,611
17	11,580	11,611	11,392	10,999	10,627
18	12,137	11,718	11,430	11,244	11,007
19	12,353	11,927	11,530	11,162	10,812
20	13,688	13,215	12,776	12,368	11,981
Average	10,853	10,653	10,462	10,289	10,119

Table 20 (continued)

## Part B - Non-avionics

## Full-time Income for Air Force Enlisted Wives (\$)

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	8,577	8,577	8,577	8,577	8,577
2	8,887	8,887	8,887	8,887	8,887
3	8,976	8,976	8,902	8,754	8,659
4	9,181	8,841	8,711	8,734	8,752
5	9,151	9,200	9,237	9,262	9,028
6	9,278	9,328	9,216	8,934	8,976
7	9,630	9,500	9,559	9,272	9,168
8	9,988	9,489	9,559	9,380	9,210
9	9,726	9,831	9,689	9,478	9,504
10	9,930	10,037	9,594	9,678	9,287
11	10,273	9,812	9,925	9,524	9,608
12	10,659	10,181	9,990	9,883	9,547
13	10,494	10,664	10,234	10,096	9,961
14	10,700	10,471	10,435	10,040	9,836
15	11,165	10,722	10,509	10,477	10,102
16	11,237	10,790	10,390	10,030	9,966
17	11,044	11,073	10,865	10,489	10,134
18	11,632	11,230	10,953	10,775	10,548
19	11,787	11,380	11,001	10,651	10,317
20	12,232	11,809	11,417	11,052	10,706
Average	10,227	10,140	9,861	9,699	9,539

Spouse Annual Part-time Income - CONUS. The information provided by the survey used in this research did not give specific data on the number of hours worked by part-time employed wives. Therefore, a valid equation to estimate part-time earnings in the CONUS could not be developed. Instead, the median income for all enlisted wives working part-time in the CONUS was used. The annual median income for wives working part-time in the CONUS amounted to \$5,512 (\$106 X 52).

This concludes the computations required to determine the expected value of the wife's CONUS income. The next step is to repeat this methodology to find the expected value of the wife's overseas income. This process will follow branches 3 and 4 of Figure 2.

Spouse Average Time Overseas. The first element needed to estimate the expected value of spouse overseas income is the proportion of time the wife spends overseas during a 20 year career. These figures are simply the reciprocals of the spouse average time in the CONUS described earlier. For the wives of Avionics specialists this number is .195877; the number for all other wives, .162609, is slightly lower.

Probability of the Spouse Working - Overseas. The same methodology used to calculate the previous probabilities was used to determine the probability of the wife working overseas. The only change in the new computations was the use of different coefficients for the parameter estimates.

Parameter Estimates. Table 21 presents the equation explaining the likelihood of a wife working overseas. Once again, the variable "SAGE", "SSCHOOL", "SMONTHS", AND "MTOTDEBT" have the expected positive signs and are very significant. Additionally, the coefficients for "BLACK" and "MILINC" have the same sign as they did previously, and are still significant. "KIDS" and "LESS15" have negative signs as expected, but are not as significant

Table 21

Equation for the Likelihood of an  
Air Force Enlisted Wife Working - Overseas

<u>Variable</u>	<u>Parameter Estimate</u>	<u>Chi-Square</u>	<u>Prob</u>
INTERCEPT	-4.90709	41.21	.0001
SAGE	.03987	9.76	.0018
SSCHOOL	.24055	47.24	.0001
OVERSEAS	.02713	1.65	.1985
SBOONIES	.05570	.06	.8056
BLACK	1.00160	14.54	.0001
SMONTHS	.01911	17.44	.0001
MTOTDEBT	.13341	13.48	.0002
LESS15	-.20608	3.83	.0504
HUSBAND	.30754	.41	.5213
KIDS	-.14599	2.11	.1466
MILINC	-.00004	21.85	.0001
MCIVERNS	.00003	.84	.3582
MNONWAGE	.00002	1.88	.1708

as before. In fact, "KIDS" is insignificant in determining the likelihood of the wife working overseas. For this equation, the coefficients of the "SBOONIES" and "HUSBAND" variables have changed from negative to positive, but they are no longer significant. Finally, the remaining variables (OVERSEAS, MCIVERNS, and MNONWAGE) are also insignificant for the new equation.

Input Values for the Variables. The input values for the variables in this section are exactly the same as those used for calculating the probability of the wife working in the CONUS. These tables are listed in Appendix B.

Calculated Probabilities. As done previously, the final step in calculating the probability of the wife working overseas is to insert the appropriate parameter estimates and

input values into Equation 1. The resulting probabilities are shown for Avionics and Non-avionics specialists in Table 22. As experienced with the probabilities of the wives of Avionics personnel working in the CONUS, the final year probabilities increase substantially. In this case, this increase appears to be influenced by the increased size of the total family debt, a long period of time at the present location, and fewer children under the age of 15 at home. A review of this table reveals once more the direct impact of

Table 22  
Part A - Avionics  
Probability of Spouse Working Overseas

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.360	.360	.360	.360	.360
2	.405	.405	.405	.405	.405
3	.487	.487	.464	.416	.392
4	.516	.390	.357	.375	.389
5	.356	.391	.419	.438	.382
6	.390	.427	.327	.337	.367
7	.450	.425	.354	.394	.385
8	.485	.338	.387	.360	.338
9	.270	.334	.321	.293	.325
10	.368	.441	.337	.395	.321
11	.438	.330	.406	.330	.387
12	.478	.367	.356	.367	.320
13	.356	.466	.387	.396	.405
14	.349	.337	.380	.323	.319
15	.451	.377	.376	.423	.377
16	.525	.449	.393	.357	.397
17	.368	.454	.460	.422	.390
18	.371	.336	.336	.358	.364
19	.468	.430	.402	.384	.370
20	.642	.607	.579	.560	.546
Average	.427	.408	.390	.385	.377

PCS moves on the probability of a wife working.

Additionally, a comparison of Table 22 with Table 13 shows similar probabilities of working in the CONUS and overseas for the wives of Avionics personnel. However, further study of the tables indicates a noticeable drop in the probabilities of a wife of a Non-avionics specialist working overseas.

Table 22 (continued)

Part B - Non-avionics

Probability of Spouse Working Overseas

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.327	.327	.327	.327	.327
2	.408	.408	.408	.408	.408
3	.458	.458	.435	.388	.364
4	.509	.384	.351	.369	.382
5	.339	.374	.401	.420	.364
6	.393	.430	.330	.340	.371
7	.437	.412	.342	.382	.373
8	.482	.335	.384	.357	.335
9	.298	.366	.352	.322	.356
10	.382	.457	.351	.410	.334
11	.408	.304	.376	.304	.359
12	.465	.354	.344	.354	.309
13	.320	.426	.350	.358	.367
14	.397	.385	.429	.370	.365
15	.427	.355	.353	.400	.355
16	.479	.403	.350	.316	.353
17	.325	.407	.414	.377	.346
18	.415	.379	.378	.401	.408
19	.485	.447	.419	.400	.387
20	.505	.466	.438	.419	.405
Average	.413	.394	.377	.371	.363

Thus far, the probabilities of a wife working overseas have been estimated. The next section, in accordance with the bottom two branches of Figure 2, will describe the process followed to calculate the probabilities of the wife working full-time or part-time overseas.

Probability of the Spouse Working Full-time - Overseas.

The final probabilities to calculate for the determination of the expected value of spouse overseas income are those for the wife working full-time and part-time overseas. These probabilities were computed using the identical methodology described in the previous sections.

Parameter Estimates. Table 23 below presents the likelihood of working full-time equation for Air Force enlisted wives overseas. "SAGE", "SSCHOOL", "SMONTHS", and

Table 23

Equation for the Likelihood of an Air Force  
Enlisted Wife Working Full-time - Overseas

<u>Variable</u>	<u>Parameter Estimate</u>	<u>Chi-Square</u>	<u>Prob</u>
INTERCEPT	-1.97915	2.89	.0892
SAGE	.01991	1.02	.3123
SSCHOOL	.15450	9.05	.0026
OVERSEAS	-.03089	.94	.3332
SBOONIES	.06478	.03	.8519
BLACK	.63841	3.38	.0659
SMONTHS	.01176	2.84	.0917
MTOTDEBT	.13533	6.55	.0105
LESS15	-.22560	1.91	.1671
HUSBAND	-.10339	.02	.8892
KIDS	-.07420	.23	.6314
MILINC	-.00004	8.44	.0037
MCIVERNS	.00013	1.93	.1651
MNONWAGE	.00005	2.93	.0869

and "MTOTDEBT" are all still positive, but for the first time "SAGE" is not significant. Also, while the variables for children have the expected negative signs, they are insignificant in this equation. For the first time, "MNONWAGE" is significant, although only at the 10% level. The coefficients for "BLACK" and "MILINC" remain the same and are still significant. Finally, the variables "OVERSEAS", "SBOONIES", "HUSBAND", and "MCIVERNS" have no significant effect on the likelihood of the wife working full-time overseas. In contrast to the likelihood of the wife working overseas equation, "OVERSEAS" and "HUSBAND" changed signs.

Input Values for the Variables. The input values for the variables described above are the same as before and are listed in Appendix B.

Calculated Probabilities. The above parameter estimates and individual inputs were used in equation 1 and the results were multiplied by the probabilities of the wife working overseas to develop Table 24. This table displays the probabilities of the wife working full-time overseas for the Avionics and Non-avionics categories. Note that the increased probabilities of the Avionics wives working in year 20 (from Table 22) cause the probabilities of these wives working full-time overseas for that same year to increase also. Overall, the probabilities of the wives of Avionics personnel working overseas is slightly higher than for Non-avionics wives.

Table 24  
Part A - Avionics  
Probability of Spouse Working Full-time Overseas

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.224	.224	.224	.224	.224
2	.252	.252	.252	.252	.252
3	.327	.327	.306	.263	.242
4	.349	.236	.209	.223	.235
5	.199	.227	.251	.267	.219
6	.227	.258	.177	.184	.208
7	.281	.259	.200	.233	.225
8	.304	.181	.220	.198	.181
9	.124	.169	.159	.140	.162
10	.200	.260	.177	.222	.164
11	.258	.172	.231	.172	.216
12	.290	.197	.189	.197	.162
13	.184	.273	.208	.215	.222
14	.170	.162	.193	.152	.149
15	.249	.191	.190	.226	.191
16	.332	.264	.218	.189	.220
17	.188	.257	.262	.231	.205
18	.176	.152	.151	.167	.172
19	.257	.226	.204	.190	.180
20	.443	.406	.379	.360	.347
Average	.252	.235	.220	.215	.209

Table 24 (continued)

## Part B - Non-avionics

## Probability of Spouse Working Full-time Overseas

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.190	.190	.190	.190	.190
2	.262	.262	.262	.262	.262
3	.299	.299	.278	.238	.218
4	.349	.236	.208	.223	.234
5	.195	.224	.247	.263	.216
6	.232	.263	.181	.189	.213
7	.269	.248	.190	.222	.215
8	.305	.182	.220	.199	.182
9	.149	.200	.189	.167	.192
10	.215	.278	.190	.238	.177
11	.229	.149	.204	.149	.190
12	.276	.186	.178	.186	.152
13	.159	.242	.181	.187	.194
14	.212	.202	.238	.191	.187
15	.237	.180	.179	.215	.180
16	.271	.210	.170	.146	.172
17	.149	.210	.214	.187	.164
18	.223	.195	.194	.212	.218
19	.279	.247	.224	.210	.199
20	.289	.257	.233	.219	.208
Average	.240	.223	.209	.205	.198

Probability of the Spouse Working Part-time - Overseas.

The procedure used to determine the probability of the spouse working part-time in the CONUS was repeated here using overseas data. Table 25 displays these probabilities of the spouse working part-time overseas. The estimated probabilities are almost identical for both groups in this case.

Table 25  
Part A - Avionics  
Probability of Spouse Working Part-time Overseas

<u>Year</u>	Number of PCS Moves			
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
1	.136	.136	.136	.136
2	.153	.153	.153	.153
3	.160	.160	.158	.153
4	.167	.154	.149	.152
5	.157	.164	.168	.171
6	.163	.169	.151	.153
7	.170	.166	.154	.162
8	.181	.157	.167	.162
9	.146	.165	.161	.153
10	.168	.181	.161	.173
11	.180	.159	.175	.159
12	.188	.169	.168	.169
13	.172	.193	.179	.181
14	.178	.175	.186	.171
15	.202	.186	.186	.196
16	.193	.185	.176	.168
17	.180	.197	.198	.191
18	.195	.184	.184	.191
19	.211	.204	.198	.193
20	.199	.200	.200	.200
Average	.175	.173	.170	.169
				.168

Now that the various probabilities of the wife working have been calculated, the next step in the methodology is to estimate the annual full-time and part-time earnings for a wife working in the CONUS and overseas.

Table 25 (continued)

## Part B - Non-avionics

## Probability of Spouse Working Part-time Overseas

<u>Year</u>	<u>Number of PCS Moves</u>			
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
1	.137	.137	.137	.137
2	.145	.145	.145	.145
3	.159	.159	.156	.150
4	.161	.148	.143	.146
5	.144	.150	.155	.157
6	.161	.167	.149	.151
7	.168	.164	.152	.159
8	.177	.153	.163	.158
9	.149	.165	.162	.155
10	.167	.179	.161	.172
11	.179	.154	.173	.154
12	.189	.168	.166	.168
13	.161	.185	.169	.171
14	.185	.182	.191	.179
15	.190	.175	.174	.185
16	.207	.193	.180	.170
17	.175	.198	.199	.190
18	.192	.184	.184	.189
19	.206	.200	.195	.191
20	.215	.210	.205	.201
Average	.173	.171	.168	.166
				.165

Spouse Annual Full-time Income - Overseas. The number of respondents in the sample set for wives working full-time overseas was not large enough to construct a good equation to estimate annual income. In lieu of an equation, the median income of all enlisted wives working full-time overseas was used. For this category, the annual income was \$13,312 (\$250 X 52).

Spouse Annual Part-time Income - Overseas. Both of the problems cited in attempting to estimate spouse CONUS part-

time earnings and overseas full-time earnings in the previous sections were encountered when trying to estimate the annual part-time income for wives overseas. Once again, a median income for all enlisted wives, \$6,396 (\$123 X 52) for this case, was used.

Now that all of the branches from Figure 2 have been completed, the expected value of spouse income can be determined. This data is presented in the next section.

Expected Value of Spouse Income. This section concludes with a presentation of the expected value of a wife's income by year over a 20 year career. Table 26 displays the expected values for the wives of Avionics and Non-avionics personnel. As seen, Avionics wives can expect to earn slightly more money than the other wives. Consistent with the previous tables, these expected value income figures are shown for each of the five PCS scenarios. As expected, the impact of PCS moves on the expected value of wife's income is readily apparent. The first noticeable effect is the dramatic loss of income a wife can expect when faced with the requirement to relocate. Another adverse consequence of PCS moves is the impact of moving more frequently on expected income. As can be seen by comparing the different PCS scenarios, those wives experiencing more PCS moves over a career can expect a reduction in earning potential.

Table 26

## Part A - Avionics

## Expected Value of Spouse Income (\$)

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	2,834	2,834	2,834	2,834	2,834
2	3,371	3,371	3,371	3,371	3,371
3	4,232	4,232	4,022	3,598	3,384
4	4,400	3,298	3,015	3,159	3,269
5	3,050	3,343	3,571	3,727	3,235
6	3,289	3,593	2,772	2,819	3,062
7	3,933	3,697	3,067	3,402	3,309
8	4,199	2,908	3,307	3,064	2,868
9	2,157	2,656	2,538	2,307	2,546
10	3,235	3,865	2,935	3,414	2,758
11	3,932	2,950	3,590	2,909	3,384
12	4,284	3,251	3,134	3,205	2,782
13	3,234	4,211	3,453	3,505	3,556
14	3,105	2,978	3,327	2,806	2,747
15	4,116	3,395	3,348	3,740	3,294
16	4,952	4,157	3,584	3,231	3,547
17	3,739	4,527	4,536	4,115	3,760
18	3,521	3,155	3,110	3,274	3,295
19	4,568	4,134	3,811	3,587	3,414
20	7,619	7,060	6,619	6,293	6,028
Average	3,889	3,681	3,498	3,418	3,322

Now, a similar procedure will be followed to predict the expected value of the military member's part-time income.

Table 26 (continued)

## Part B - Non-avionics

Expected Value of Spouse Income

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	2,638	2,638	2,638	2,638	2,638
2	3,387	3,387	3,387	3,387	3,387
3	3,797	3,797	3,606	3,221	3,027
4	4,191	3,159	2,894	3,029	3,132
5	2,919	3,197	3,414	3,562	3,092
6	3,395	3,693	2,883	2,925	3,165
7	3,724	3,502	2,911	3,224	3,136
8	4,170	2,914	3,301	3,064	2,871
9	2,645	3,192	3,060	2,802	3,061
10	3,405	4,027	3,100	3,575	2,916
11	3,566	2,666	3,251	2,628	3,062
12	4,140	3,150	3,036	3,103	2,696
13	2,972	3,887	3,175	3,223	3,271
14	3,702	3,558	3,919	3,358	3,286
15	3,964	3,272	3,225	3,599	3,171
16	4,439	3,710	3,199	2,872	3,158
17	3,173	3,883	3,895	3,519	3,205
18	4,231	3,821	3,760	3,926	3,937
19	4,960	4,514	4,178	3,942	3,756
20	5,174	4,714	4,367	4,122	3,930
Average	3,730	3,534	3,360	3,286	3,195

Expected Value of Member Part-time Income

The next section of Chapter 4 is devoted to estimating the expected values of member's part-time income for Avionics and Non-avionics specialists over a typical career. The methodology used here is similar to that used in determining the expected values of spouse income, and will follow the diagram shown earlier in Figure 3. The upcoming sections discuss the process used to determine the proportion of time an Air Force enlisted member is stationed in the CONUS and

overseas, the probability of the member working in the CONUS and overseas, and the median income received by members working in these locations.

Member Average Time in the CONUS. The initial step in determining the expected value of the member's part-time income is to weight the product of the probability of the member working and his part-time earnings by the mean proportion of time the member spends in the CONUS during a career. For members with an avionics specialty this number is .783505; for all others this value is .818538.

Probability of the Member Working - CONUS. As stated above, the methodology used in this section is similar to the procedure followed earlier in the chapter. Equation 1, the formula used for calculating the probabilities associated with the spouse working, is also used for this probability. However, new variables have been introduced for determining the member probabilities.

Parameter Estimates. Table 27 presents the results of the equation estimating the likelihood of the member working in the CONUS. The variable "MMONTHS" measures the number of months the member has been at his present location and has a significant impact on the equation. "MTOTDEBT" (a categorical measure of the family's total debt) also has a positive and significant effect. On the other hand, the amount of military pay a member receives (MILINC) is negative and significant. The coefficient of "MRANK" (the

Table 27

**Equation for the Likelihood of an Air Force  
Enlisted Member Working - CONUS**

<u>Variable</u>	<u>Parameter Estimate</u>	<u>Chi-Square</u>	<u>Prob</u>
INTERCEPT	-2.95215	117.64	.0001
MMONTHS	.00674	6.562	.0104
BOONIES	-.06274	.18	.6708
MNONWAGE	-2.7E-7	.00	.9848
MTOTDEBT	.17480	23.90	.0001
MILINC	-.00008	9.45	.0021
SEPARATE	-.01758	1.18	.2764
MRANK	.14581	3.52	.0607
KIDS	.13014	7.34	.0067

rank of the member) is positive and significant. The last significant variable, "KIDS" is also positively related to the likelihood of the member working. Finally, "BOONIES" (implying limited labor market opportunities), "MNONWAGE" (family income from other sources), and "SEPARATE" (the amount of time a member is assigned away from his family) are all insignificant for this equation.

Input Values for the Variables. As was the case for the probabilities of a spouse working, the variable "MMONTHS" is critical for the upcoming calculations. The inputs for this variable, representing the length of time the member has been at his present location, are identical to the inputs for the spouse found in Table 12. Once again, the rationale for changing the "MMONTHS" variable is to help evaluate the impact of PCS moves on family income. The input values for the remaining parameters are listed in Appendix D. The value for "SEPARATE" is a constant indicating the average

amount of time a member is stationed in a location apart from his family. The inputs for the other variables (MMONTHS, BOONIES, MNONWAGE, MTOTDEBT, MILINC, MRANK, and KIDS) represent the means for each parameter by year over a 20 year career. Note that the input values in Appendix D are shown for both Avionics and Non-avionics personnel.

Calculated Probabilities. Using these input values, parameter estimates, and Equation 1 the probability of an Air Force member working can be determined by year over a 20 year period. Table 28 shows these probabilities for a varied number of moves for Avionics and Non-avionics specialists. The first noticeable difference between this set of tables and the tables listing the spouse probabilities is the substantial decrease in the probability of a member working as compared to the spouse. However, this is not unexpected since all of the members are pursuing a full-time military career and Table 28 indicates the member's probabilities of working an additional job. The direct impact of PCS moves are again evident as the probability of a member working tends to decrease during the year of a move. Additionally, as seen in the last column of both tables (indicating a family making 9 PCS moves over a career), increased mobility generally decreases the probability of the member working.

Table 28  
Part A - Avionics  
Probability of Member Working in the CONUS

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.085	.085	.085	.085	.085
2	.087	.087	.087	.087	.087
3	.090	.090	.087	.082	.079
4	.105	.089	.085	.088	.089
5	.078	.082	.085	.087	.080
6	.085	.089	.078	.079	.082
7	.108	.105	.095	.101	.099
8	.103	.085	.091	.087	.085
9	.080	.088	.086	.083	.087
10	.100	.110	.096	.104	.094
11	.109	.094	.105	.094	.102
12	.129	.112	.111	.112	.105
13	.089	.103	.093	.094	.095
14	.098	.097	.103	.095	.094
15	.088	.079	.079	.084	.079
16	.117	.106	.099	.094	.099
17	.089	.100	.101	.096	.092
18	.085	.081	.081	.084	.084
19	.092	.088	.084	.082	.081
20	.120	.115	.111	.108	.106
Average	.097	.094	.092	.091	.090

Following branch 5 of Figure 3, the next step in estimating the expected value of member CONUS income is to determine the member's part-time CONUS earnings. This procedure is described below.

Table 28 (continued)

## Part B - Non-avionics

## Probability of Member Working in the CONUS

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.086	.086	.086	.086	.086
2	.086	.086	.086	.086	.086
3	.096	.096	.093	.088	.085
4	.120	.103	.098	.101	.102
5	.088	.093	.096	.099	.092
6	.096	.101	.088	.090	.094
7	.105	.102	.093	.099	.097
8	.116	.096	.102	.099	.096
9	.092	.101	.099	.095	.100
10	.102	.113	.098	.106	.096
11	.105	.091	.100	.091	.098
12	.121	.105	.103	.105	.098
13	.089	.103	.093	.094	.096
14	.098	.097	.102	.095	.094
15	.102	.093	.092	.098	.093
16	.121	.110	.103	.098	.103
17	.087	.098	.099	.094	.090
18	.099	.094	.094	.097	.098
19	.098	.093	.090	.088	.086
20	.102	.097	.094	.091	.090
Average	.101	.098	.096	.095	.094

Member Median Income - CONUS. An equation estimating the member's annual part-time income could not be developed because of the small sample size of the respondents. Therefore, the median income for all enlisted members working in the CONUS, \$1,700, was used.

This determination of CONUS median income marks the end of the calculations needed for the expected value of the member's part-time income. The upcoming sections describe

the methodology for determining the final branch of Figure 3, the expected value of member overseas income.

Member Average Time Overseas. To begin the calculations, branch 6 of Figure 3 (the probability of the member working overseas times the median overseas earnings) will have to be multiplied by the average proportion of time a member spends overseas. For members overseas these numbers are .216495 and .181465 for Avionics and Non-avionics career fields respectively.

Probability of the Member Working - Overseas. Due to the small number of respondents from the survey working overseas, an equation estimating the likelihood of a member working could not be constructed. In its place marginal probability tables were developed. Table 29 displays the results of this procedure. These probabilities were determined by first comparing the actual percentage of members working in the CONUS to the actual percentage of members working overseas, and then subtracting the difference from the estimated likelihood of the member working in the CONUS. For example, for year 1 in each of the categories, the difference between the actual percentage of members working in the CONUS and the actual percentage of members working overseas is .050 (.116 - .066). This difference subtracted from the estimated likelihood of the member working in the CONUS for year 1 (from Table 4-18) results in a probability of the military member working overseas of .036

Table 29

## Part A - Avionics

## Probability of Member Working Overseas

<u>Year</u>	<u>Number of PCS Moves</u>				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.036	.036	.036	.036	.036
2	.038	.038	.038	.038	.038
3	.040	.040	.038	.032	.030
4	.056	.040	.036	.038	.040
5	.028	.032	.035	.037	.031
6	.035	.040	.028	.029	.033
7	.059	.055	.046	.051	.050
8	.054	.035	.041	.038	.035
9	.030	.038	.037	.033	.037
10	.051	.061	.046	.054	.044
11	.060	.045	.055	.045	.053
12	.080	.063	.061	.063	.056
13	.039	.053	.043	.044	.045
14	.049	.047	.053	.045	.045
15	.038	.030	.030	.035	.030
16	.068	.057	.050	.045	.050
17	.040	.051	.052	.047	.043
18	.036	.032	.032	.034	.035
19	.042	.038	.035	.033	.031
20	.071	.065	.061	.059	.057
Average	.047	.045	.043	.042	.041

(.086 - .050). This methodology assumes that the marginal difference between actual CONUS and projected overseas members working will remain constant. As can be expected from this assumption, the behavior of these probabilities with respect to the impact of PCS moves is the same as the previous probabilities for the member working in the CONUS.

Table 29 (continued)  
Part B - Non-avionics  
Probability of Member Working Overseas

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	.037	.037	.037	.037	.037
2	.037	.037	.037	.037	.037
3	.047	.047	.044	.038	.035
4	.071	.053	.049	.051	.053
5	.039	.043	.047	.049	.042
6	.047	.052	.039	.040	.044
7	.056	.053	.043	.049	.047
8	.066	.046	.053	.049	.046
9	.042	.051	.049	.045	.050
10	.053	.063	.049	.057	.046
11	.055	.041	.051	.041	.048
12	.071	.055	.054	.055	.048
13	.040	.054	.044	.045	.046
14	.049	.047	.053	.045	.045
15	.052	.043	.043	.049	.043
16	.072	.061	.053	.048	.053
17	.038	.048	.049	.044	.040
18	.049	.045	.045	.048	.048
19	.048	.044	.040	.038	.037
20	.052	.048	.044	.042	.040
Average	.051	.048	.046	.045	.044

Member Median Income - Overseas. Due to the limited number of respondents in this category, a model predicting member part-time overseas income could not be constructed. An alternative measure, the median income for all enlisted personnel overseas was used in its place. The median income for those members working overseas totaled \$2,088.

Expected Value of Member Part-time Income. At this point, all of the values needed to determine the expected value of an Air Force enlisted member's part-time income have

been calculated. The resulting expected values are shown in Table 30 below. As seen, the expected contributions of the

Table 30

Part A - Avionics

Expected Value of Member Part-time Income (\$)

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	130	130	130	130	130
2	134	134	134	134	134
3	138	138	133	124	119
4	165	137	130	134	137
5	116	123	129	132	121
6	129	136	116	118	124
7	171	165	148	157	155
8	161	129	139	134	129
9	120	135	132	125	132
10	156	174	149	163	145
11	172	146	164	146	160
12	209	178	175	178	165
13	136	161	143	145	147
14	153	150	161	147	146
15	134	119	119	128	119
16	187	168	154	146	155
17	137	156	158	149	142
18	130	122	122	127	128
19	130	134	128	124	122
20	192	182	175	170	167
Average	151	146	142	141	139

member's part-time earnings are significantly less than the expected wages of the spouse. Once again, the impact PCS moves has on expected earnings is apparent, although not as significant here because of the relatively lower dollar amounts involved. These numbers are low because of the much smaller probabilities of a member working an additional job

Table 30 (continued)

## Part B - Non-avionics

## Expected Value of Member Part-time Income (\$)

Year	Number of PCS Moves				
	5	6	7	8	9
1	134	134	134	134	134
2	134	134	134	134	134
3	151	151	146	136	132
4	195	163	155	159	163
5	138	146	152	156	143
6	152	160	138	140	147
7	168	162	146	155	153
8	187	151	162	156	151
9	143	160	156	149	157
10	162	181	155	169	151
11	167	142	159	142	155
12	295	166	164	166	155
13	139	164	146	148	150
14	155	152	163	149	148
15	162	145	145	155	145
16	196	176	163	154	164
17	136	154	156	147	140
18	156	148	148	153	155
19	154	146	140	136	134
20	162	153	147	143	140
Average	159	154	150	149	147

in the CONUS and overseas. Since these probabilities play an important role in determining the expected value of member part-time income, these lower earnings are to be expected.

The computations of the expected value of the member's part-time income (Figure 3) completes the second main section of this chapter. The remaining element to discuss is the calculation of the expected value of the member's military income.

### Expected Value of Military Income

This chapter concludes with an explanation of the methodology used to predict military income for Avionics and Non-avionics personnel.

Parameter Estimates. Table 31 below presents the equation explaining the member's annual military pay. The dependent variable for this equation is military earnings.

Table 31

Equation for Air Force Enlisted Military Income

<u>Variable</u>	<u>Parameter Estimate</u>	<u>t</u>	<u>Prob</u>
INTERCEPT	15090.69	9.600	.0001
YEAR	709.33	20.115	.0001
MAGE	-39.30	-.404	.6860
MAGE2	-.19	-.131	.8957
EDLEVEL	99.83	1.983	.0476
MOVERSEA	-2.79	-1.285	.1988
FLTPAY	548.02	1.653	.0985
PROPAY	2237.05	8.461	.0001

Military income is primarily determined by the member's rank, the number of years of service, and any special pays received. The number of years of service (YEAR) is both positive and significant as expected. However, the member's age and age squared (MAGE2) are insignificant for this equation. The variable "EDLEVEL", identifying the member's education level, is also positive and significant. The coefficient for the amount of time the member spent overseas (MOVERSEA) is negative and insignificant in determining the member's military income. Finally, the variables defining

the special pays (FLTPAY and PROPAY) have the expected positive signs and are significant for this equation.

As done previously, the next step is to determine the means used for the input values for the above variables.

Input Values for the Variables. The input values for Avionics and Non-avionics personnel are listed in Appendix E. Once again, there is a mixture of constant and varying means. The value for the member's education level is a constant reflecting the mean education level for personnel at the time they entered the service. The inputs for "MAGE" depict the average age of the enlisted members upon entering the service and are incremented by one for each additional year. The remaining input values are means that change over the 20 year period.

Calculated Military Income. As mentioned at the beginning of this section, the dependent variable of the equation is the member's annual military income. Multiplying the parameter estimates by the appropriate input values and adding them together results in the estimated military earnings shown in Table 32. As can be seen in the table, the income for both categories is very close throughout the 20 year period.

This chapter has traced the methodology followed to determine the expected values of spouse earnings, member part-time income, and member military pay. Spouse income and member part-time income were presented for five different PCS

Table 32  
Annual Air Force Enlisted Military Income (\$)

<u>Year</u>	<u>Avionics</u>	<u>Non-avionics</u>
1	16,322	16,300
2	16,989	16,970
3	17,655	17,654
4	18,305	18,311
5	18,970	18,933
6	19,612	19,606
7	20,270	20,335
8	20,975	20,945
9	21,557	21,664
10	22,282	22,241
11	22,874	22,964
12	23,516	23,672
13	24,097	24,147
14	24,790	24,891
15	25,494	25,533
16	26,080	26,111
17	26,743	26,761
18	27,393	27,498
19	28,012	28,102
20	28,671	28,716

scenarios to allow an evaluation of the impact of mobility on these expected values. The next chapter takes a closer look at the net effect of PCS moves on family income by combining the data calculated in Chapters 3 and 4.

## V. Analysis

This chapter analyzes the impact of varying the number of PCS moves between 5 and 9 on the total family income of Avionics personnel versus other career fields. This analysis considers the effect of mobility by bringing together the four components discussed in the two previous chapters: military salary, spouse income, member part-time earnings, and unreimbursed moving expenses. Military pay, shown earlier in Table 32, is not directly impacted by varying the number of PCS moves, but is one of the key elements of family income. Spouse income (Table 26) and member part-time income (Table 30) were shown to be affected by PCS moves. Finally, the unreimbursed moving expenses will only be a factor in the year of a PCS move; thus, increasing the number of moves raises the effect of unreimbursed expenses on family income. The net impact of varying the number of PCS moves is found by combining the above elements--the sum of military, spouse, and member part-time income less unreimbursed moving expenses (if any). This will yield the yearly family income for each of the 20 years of a member's career, for each of the five PCS scenarios. Once these annual values are computed, the present value annuity of each 20 year income stream will be calculated using a discount rate of 3% (see footnote).

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A 3% rate was chosen as an estimate of the average real rate of interest net of inflation.

Chapter 5 is presented in two main parts. The first section presents the results of this research by combining the data calculated in Chapters 3 and 4 as described above. The last half of this chapter discusses the results of a sensitivity analysis performed on the data. This analysis displays the effect of PCS moves on family income for three different situations: first, the wife works full-time for each year of her husband's career; second, the spouse only works part-time over the 20 year period; and third, the spouse does not work at all.

#### Impact of PCS Moves on Family Income

This section begins with a presentation of the 20 year income streams found by adding military, spouse, and member earnings and deducting any unreimbursed moving expenses. Table 33 below displays these annual amounts for Avionics and Non-avionics personnel for the five PCS scenarios. As the table shows, the difference in family income for the two categories is rather small. However, the effect of PCS moves on family income is readily apparent. The asterisks in the table are used to highlight the year a family makes a move. An examination of these marked values shows a noticeable decrease in total family income for the move year when compared to the year immediately preceding the the move. Additionally, these annual income figures offer clear evidence of the impact of moving more frequently on family income. As the table shows, increasing the number of PCS

Table 33  
Part A - Avionics  
Air Force Enlisted Family Income (\$)

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	17,903*	17,903*	17,903*	17,903*	17,903*
2	20,493	20,493	20,493	20,493	20,493
3	22,023	22,023	20,426*	19,992*	19,773*
4	22,871	20,357*	24,451	21,598	21,711
5	20,753*	22,437	22,670	22,830	20,943*
6	23,030	23,342	21,117*	21,165*	22,798
7	24,374	22,749*	23,485	23,829	22,351*
8	25,336	24,012	24,421	22,790*	23,972
9	22,451*	24,347	22,843*	23,990	22,852*
10	25,672	26,321	25,366	25,859	25,184
11	26,978	24,587*	26,629	24,545*	26,418
12	28,009	26,945	25,442*	26,899	25,080*
13	26,083*	28,469	27,693	26,363*	27,800
14	28,048	26,535*	28,277	27,743	26,300*
15	29,743	29,007	27,577*	29,362	28,907
16	31,219	30,404	29,828	28,073*	28,399*
17	29,236*	30,044*	31,437	31,007	30,646
18	31,043	30,670	29,242*	29,410*	29,432*
19	32,722	32,279	31,951	31,724	31,548
20	36,483	35,913	35,466	35,135	34,866
Average Total Income	26,224	25,942	25,686	25,536	25,368
Present Value	524,471	518,838	513,716	510,711	507,376
Annuity	379,258	375,180	371,422	369,409	366,963
	25,492	25,218	24,965	24,830	24,666

\* denotes the year of a PCS move

moves decreases the family's average income. For Avionics personnel, each additional move reduces the average family income by approximately \$214. The families of enlisted personnel in other career fields can expect to lose on average about \$204 per each additional move.

Table 33 (continued)

## Part B - Non-avionics

## Air Force Enlisted Family Income (\$)

<u>Year</u>	Number of PCS Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
1	17,724*	17,724*	17,724*	17,724*	17,724*
2	20,491	20,491	20,491	20,491	20,491
3	21,601	21,602	20,058*	19,663*	19,464*
4	22,697	20,286*	21,360	21,499	21,606
5	20,642*	22,275	22,498	22,651	20,821*
6	23,153	23,460	21,279*	21,323*	22,918
7	24,227	22,652*	23,391	23,713	22,277*
8	25,302	24,010	24,409	22,817*	23,967
9	23,104*	25,016	23,532*	24,615	23,535*
10	25,808	26,448	25,495	25,985	25,307
11	26,696	24,423*	26,374	24,385*	26,181
12	28,007	26,988	25,524*	26,941	25,175*
13	25,911*	28,198	27,469	26,171*	27,569
14	28,748	27,254*	28,973	28,398	26,977*
15	29,659	28,950	27,555*	29,288	28,849
16	30,746	29,997	29,473	27,790*	28,084*
17	28,722*	29,451*	30,811	30,427	30,107
18	31,885	31,468	30,059*	30,230*	20,242*
19	33,217	32,763	32,421	32,181	31,992
20	34,052	33,583	33,230	32,982	32,786
Average	26,120	25,852	25,606	25,464	25,304
Total Income	522,393	517,037	512,129	509,273	506,071
Present Value	377,916	374,048	370,433	368,512	366,159
Annuity	25,402	25,142	24,899	24,770	24,612

\* denotes the year of a PCS move

The remaining three lines in the table offer additional ways to compare the expected family income of Avionics and Non-avionics personnel. Total income represents the sum of the family's income over the member's career. Although these dollar values are larger than the average figures, the difference between the two groups is still relatively minor.

The present value of the total income denotes the amount of money required to pay out the listed 20 year income streams at a 3 percent rate of interest. Finally, the present value of an annuity indicates the constant annual cash flow required to pay out the 20 year income streams at a 3 percent interest rate. Figure 4 also displays this present value of the annuities information for Avionics and Non-avionics families. It is not surprising that the present values of

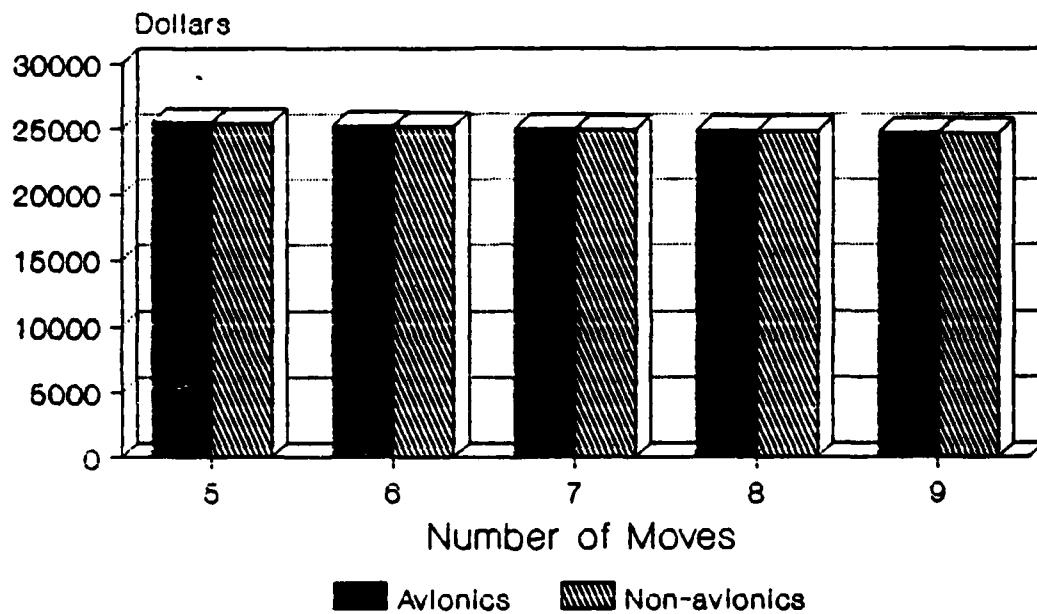


Figure 4. Present Value of the Annuities for Avionics and Non-avionics Family Income

the annuities for the two categories are similar, since their annual incomes over the 20 year period were approximately the same. Of interest here is the noticeable drop in the amount for the present value of the annuity as the number of moves is increased. On the average, increasing the number of PCS

moves reduces the present value of the annuity by approximately \$207 and \$195 for Avionics and Non-avionics personnel respectively per move. These numbers are low because they represent the average impact for all families, but only about one-half of all wives work and less than 10 percent of the members have part-time jobs. Additionally, future losses in income have been reduced by application of the present value formula.

In summary, the analysis shows the impact of PCS moves on family income to be twofold. First, there is a noticeable decrease in family income for a year in which a move is made. Second, PCS moves also have a cumulative effect on income. Increasing the number of PCS moves over a 20 year career reduces the family's total income.

This concludes the analysis of the effect PCS moves have on a family's income. The last half of this chapter is devoted to a sensitivity analysis of the impact on family income for wives who work full-time only, part-time only, or don't work at all.

#### Sensitivity Analysis

The previous analysis was based on the data accumulated in Chapters 3 and 4. As shown in Chapter 4, key factors in determining the expected value of spouse income are the probability of the wife working and the probability of the spouse working either full-time or part-time. This section

of Chapter 5 examines the effect on family income for three different situations.

The first scenario assumes that a wife will work full-time for each of the 20 years of her husband's career. The other two scenarios assume that a wife works part-time or does not work at all during the 20 year period. It is assumed that in the year following a move the wife loses 3 months of work time. Tables 34 and 35 display the average

Table 34  
Enlisted Family Income if Wives Work Full-time (\$)

Part A - Avionics

	Number of Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
Average Total Income	32,991	32,614	32,263	31,933	31,591
Present Value	659,822	652,281	645,251	638,662	631,813
Annuity	478,543	473,067	467,997	463,4842	458,474
	32,166	31,798	31,457	31,153	30,817

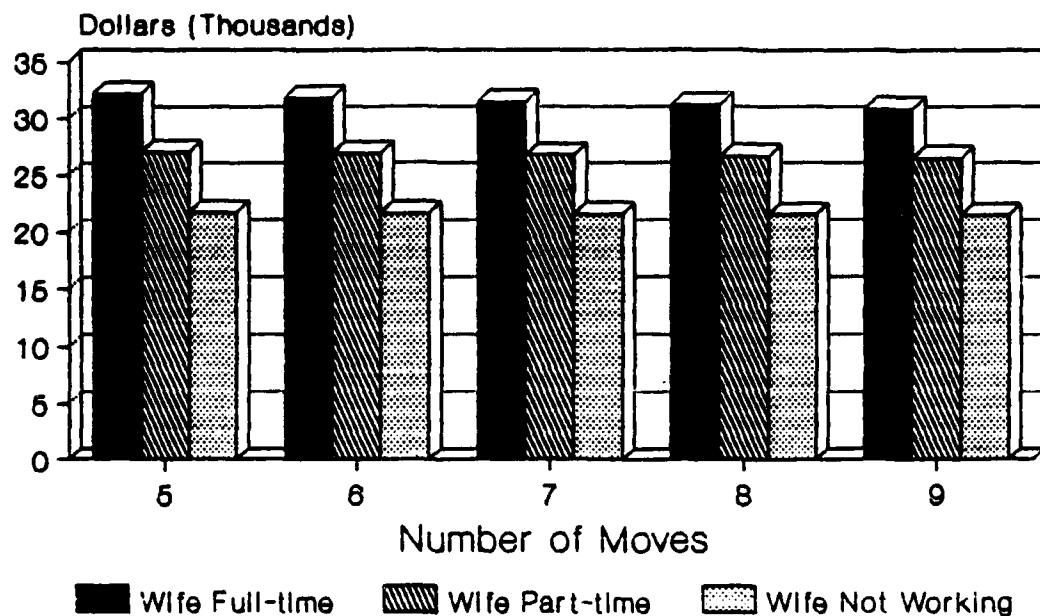
Part B - Non-avionics

	Number of Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
Average Total Income	32,471	32,118	31,770	31,451	31,129
Present Value	649,416	642,350	635,395	629,027	622,588
Annuity	470,879	465,755	460,749	456,384	451,675
	31,650	31,306	30,970	30,676	30,360

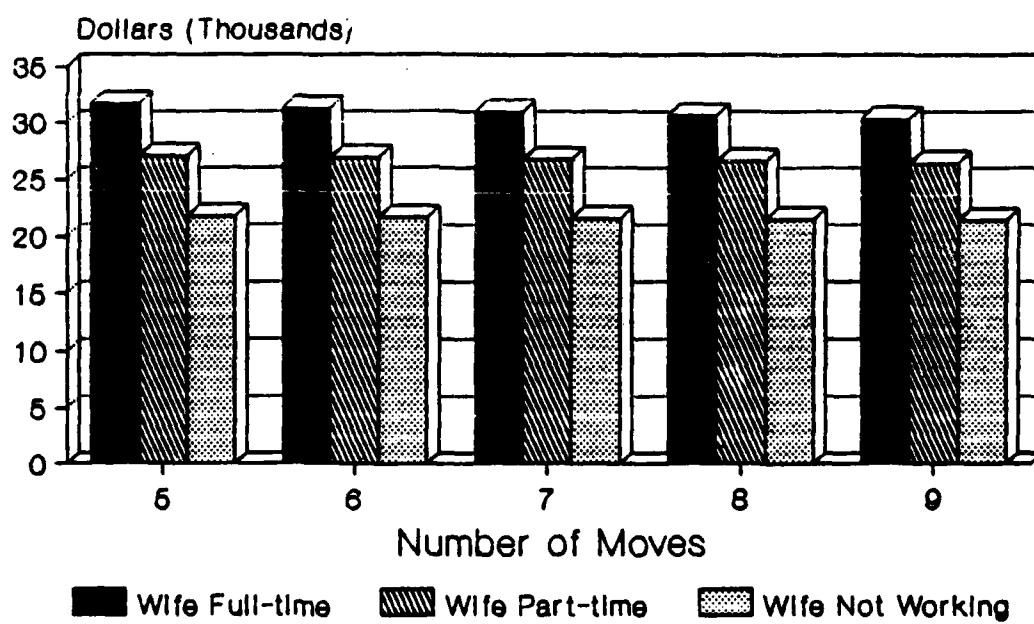
Table 35  
Enlisted Family Income if Wives Work Part-time (\$)

	Part A - Avionics				
	Number of Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
Average Total Income	27,665	27,520	27,376	27,234	27,092
Present Value Annuity	553,297	550,399	547,515	544,684	541,845
	401,664	399,423	397,234	395,236	393,039
	26,998	26,847	26,700	26,566	26,418
	Part B - Non-avionics				
	Number of Moves				
	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
Average Total Income	27,692	27,549	27,407	27,268	27,128
Present Value Annuity	553,847	550,989	548,146	545,359	542,563
	402,011	399,801	397,642	395,676	393,513
	27,021	26,873	26,728	26,596	26,450

income, total income, present value of total income and present value of the annuities for Avionics and Non-avionics families for the first two scenarios. As seen in the tables, Avionics families average just under \$500 more annually than Non-avionics families if the wives work full-time. However, when the wives work part-time only, the total family income is very similar, with the families of Non-avionics personnel earning just over \$30 more per year. Figures 5 and 6 show the resulting present values of the annuities for all three scenarios for Avionics and Non-avionics personnel. It is



**Figure 5. Present Value of the Annuities for Avionics Family Income**



**Figure 6. Present Value of the Annuities for Non-avionics Family Income**

important to note that for each scenario the present values decrease as the number of PCS moves increase, consistent with the previous analysis. However, the amount of the reduction is much less noticeable when the spouse worked part-time or did not work at all. These results show that the impact of increased mobility is more pronounced for wives in full-time jobs. Also of note is the vast difference in present values among the three scenarios. The present value of the annuity for Avionics wives working full-time only averages approximately \$4,772 more than if these same wives worked part-time only and over \$9,940 more than if they did not work at all. Likewise, the wives of personnel in other career fields working full-time versus part-time or not at all gain over \$4,259 and \$9,402 respectively.

The results of the analysis presented in this chapter highlight the net impact of PCS moves on total family income. This effect is not only felt directly during the year of a move, but there is a cumulative effect when increasing the number of times a family moves. Additionally, this chapter showed the effect on family income for wives working full-time, part-time, or not at all throughout their husband's career. As expected, wives able to work full-time make a much larger contribution to family income than wives either in part-time jobs or not working.

## VI. Conclusions and Recommendations

### Overview

The intent of this research was to examine the impact of PCS moves on the family income of Air Force enlisted personnel in the Avionics career field or in other specialties. Two types of cost associated with moving were analyzed for this effort. The first type, direct costs, are the moving expenses not reimbursed by the government. The other type of costs, indirect, consider the effect of mobility on spouse income and member part-time earnings. To facilitate evaluating the impact of PCS moves on these costs annual family income streams for a 20 year period (the length of a typical career) were estimated. Additionally, these annual income streams were varied to reflect a family moving between 5 and 9 times during the 20 year career. These income streams were then discounted at a 3% rate to allow a comparison of total family income for different frequencies of PCS moves.

To accomplish the research objective, data was collected and analyzed to answer a series of research questions (previously outlined in Chapter 2). This chapter summarizes the answers to these questions.

### Research Questions

The initial research question focused on unreimbursed moving expenses and the effect they have on family income.

Table 3-1 in Chapter 3 presents the average unreimbursed moving expenses for three types of PCS moves: CONUS to overseas, CONUS to CONUS, and overseas to CONUS. This data shows that families moving to or from an overseas location can expect to incur greater unreimbursed expenses than families moving within the CONUS. In any case, as the table shows, the amount of unreimbursed expenses for any type of move is substantial. It follows then that increasing the frequency of PCS moves has a detrimental effect on family income over a 20 year career.

The next sequence of questions concentrated on the effect of PCS moves on spouse income. Chapter 4 presents the methodology followed to calculate the expected value of a wife's income over a 20 year period. As shown in Figure 2 of that chapter, key elements of the wife's expected income include the probability of the wife working and the probability of the wife working full-time versus part-time. The final calculations identified two effects of PCS moves on the probabilities associated with the wife working, which in turn affect the expected income. First of all, the probabilities are lower by as much as 15 to 20 percent during the year of a move, causing the expected value of spouse income to suffer during these move years. Additionally, as the number of PCS moves made by a family over the 20 year career increase, the probabilities of the wife working

decrease. Once again, this reduces the expected spouse income.

The third research question dealt with the effect of PCS moves on the military member's part-time income. This information is also presented in Chapter 4. Similar to the expected value of spouse income, the member's part-time earnings are affected primarily by the probability of the military member working the additional job. The impact of PCS moves on this probability is the same as the effect of moving on the wife's probabilities of working. Once again, the probability of the member working during the year of a move is lower than the same probability for the year preceding the move. Also, the more frequently the member moves during his career, the less likely he is to work an additional job. Therefore, PCS moves reduce the contribution of member part-time earnings to the family's total income.

Finally, the last question asked about the impact of PCS moves on the family income of Avionics personnel as compared to members in other specialties. As shown in Chapter 5, the actual difference in the present values of the annuities for these two categories is relatively minor. However, the impact of moving more often on these present values is noticeable in both cases (approximately \$200 less for each additional move over a career). The sample data revealed that Air Force enlisted personnel either in Avionics specialties or other career fields can expect to move

approximately 5.5 times during a 20 year career. Table 36 presents the total family income figures for both groups using this average of 5.5 PCS moves.

**Table 36**  
**Family Income for 5.5 PCS Moves (\$)**

<u>Year</u>	<u>Avionics</u>	<u>Non-avionics</u>
1	17,903	17,724
2	20,493	20,491
3	22,023	21,602
4	21,614	21,491
5	21,595	21,459
6	23,186	23,306
7	23,561	23,439
8	24,674	24,656
9	23,399	24,060
10	25,997	26,128
11	25,783	25,560
12	27,477	27,497
13	27,276	27,055
14	27,292	28,001
15	29,375	29,304
16	30,812	30,372
17	29,640	29,087
18	30,857	31,676
19	32,501	32,990
20	36,198	32,818
<b>Average</b>	<b>26,083</b>	<b>25,986</b>
<b>Total Income</b>	<b>521,655</b>	<b>519,715</b>
<b>Present Value</b>	<b>377,219</b>	<b>375,982</b>
<b>Annuity</b>	<b>25,355</b>	<b>25,272</b>

#### Conclusion

In summary, this research has shown that the PCS moves an Air Force enlisted family makes reduces the expected value

of the family's total income. The analysis has identified two important effects of moving on family income.

First, the expected family income is lower during the year a family experiences a move. There are two main reasons for this. To begin with, the family incurs moving expenses that are not reimbursed by the government. These out of pocket expenses range from approximately \$1,160 to \$2,415 depending on the type of move (CONUS to overseas, CONUS to CONUS, or overseas to CONUS). As might be expected, moves to or from an overseas location are more expensive than PCS moves within the CONUS. Additionally, family income suffers during a move year because of the decreased likelihoods of the wife working and the member working an additional job. This impacts the earnings from these two sources for that year, lowering the total income for the family.

Finally, moving more frequently decreases the expected value of family income over the 20 year period. When a family moves more often they are faced with the out of pocket expenses experienced during a move more frequently. Also, increased mobility reduces the probabilities of the wife and the military member working. This in turn detracts from the total family income. For this research, this amounted to a reduction in annual income expressed in terms of an annuity of approximately \$207 and \$195 per additional move for Avionics and Non-avionics personnel respectively.

### Recommendations

This research has focused on the impact of mobility on family income and has been limited somewhat by the survey data used. However, there are several related areas of interest which should be pursued. First, more complete wage information is needed to construct models for predicting income, especially part-time income. The survey used for this study did not provide detailed enough information to determine the part-time wage rate. In this research, the data was only sufficient to build one model (predicting the wife's full-time income in the CONUS). In the other cases, median income values had to be used. Another related topic is the history of the wife's labor force participation. The survey used for this thesis could only identify the number of women who actually worked. It would be interesting to know more about the work experience profile of those military wives that work. For this research, only cross-sectional information was available. It would be more helpful to know the actual work experience for the individuals. This would allow the work to be segmented into more meaningful groups and provide a better idea of how mobility impacts a wife's work and earnings. A third area for further study centers around the importance of spouse income in a member's decision to remain in or separate from the Air Force. The focus in this case would be the relationship between mobility, spouse employment, and

retention. Finally, a study of lifetime income should be accomplished. This would go beyond the typical 20 years of an Air Force career, and examine the extent to which mobility in a military career affects earnings in second careers for both the husband and his spouse.

**Appendix A: Definition of Variables**

AGE - respondent's age

ASIAN - race variable

BLACK - race variable

BOONIES - a proxy for limited labor market opportunities resulting from living in less populated areas

EDLEVEL - number of years of schooling for the member at the time he entered the Air Force

EDUCATION - number of years of education at the time the member entered the Air Force

EDUC\*SKILL - measures the interaction of the education level with the respondent's assessment of how much her skills are needed for her job

FLTPAY - special pay for aircrew members

HUSBAND - proportion of time the husband is stationed at same location as his family

KIDS - number of children living at home

LESS15 - number of children under the age of 15

LT12 - dummy variable used to indicate wives married less than 12 months

MAGE - member's age

MAGE2 - member's age squared

MCIVERNS - member's part-time earnings

MILINC - member's military income

MILLS - self-selection bias correction term suggested by Heckman

MMONTHS - number of months the member has been at the present location

MNONWAGE - amount of family income from other sources

MRANK - categorical variable indicating the member's rank

**Appendix A (continued)**

**MTOTDEBT** - categorical variable representing total family debt

**OVERSEAS** - number of months the spouse has spent overseas

**PROPAY** - special pay for skills in short supply to improve retention

**SAGE** - wife's age

**SBOONIES** - a proxy for limited labor market opportunities resulting from living in less populated locations

**SEPARATE** - proportion of time the member is stationed at a location apart from his family

**SMONTHS** - number of months the spouse has been at the present location

**SOVERSEAS** - number of months the spouse has spent overseas

**SSCHOOL** - number of years of schooling for the spouse at the time her husband entered the Air Force

**TENURE** - number of months a wife working full-time has been at her current job

**WMOVES** - number of PCS moves made by the wife

**Appendix B: Input Values for the Variables Used to Estimate  
the Probabilities of a Wife Working**

**Avionics**

<u>BLACK</u>	<u>HUSBAND</u>	<u>INTERCEPT</u>	<u>KIDS</u>	<u>LESS15</u>	<u>MCIVERNS</u>	<u>MILINC</u>
.058	.983	3.349	.88	.50	37.50	11294
			.79	.79	171.43	8916
			.60	.50	180.00	9105
			.95	.89	0.00	10589
			1.00	1.00	294.74	12165
			1.19	1.10	452.38	12746
			1.50	1.38	182.08	12265
			1.61	1.61	95.65	13539
			2.14	2.07	28.57	13197
			1.82	1.82	0.00	13343
			1.95	1.84	136.84	14077
			2.40	2.20	266.67	14038
			1.82	1.73	55.82	14835
			2.43	2.43	621.43	15427
			1.71	1.71	571.43	16569
			2.19	2.00	214.25	16425
			1.86	1.64	0.00	17582
			2.30	2.10	0.00	17689
			2.14	1.71	245.24	17725
			1.75	.88	2000.00	18807

<u>MNONWAGE</u>	<u>MTOTDEBT</u>	<u>OVERSEAS</u>	<u>SAGE</u>	<u>SBOONIES</u>	<u>SSCHOOL</u>
2203	4.38	0.00	20	0.50	12.875
97	3.86	0.00	21	0.07	
234	3.70	0.00	22	0.10	
94	4.00	0.05	23	0.21	
1302	4.00	2.16	24	0.11	
379	3.95	0.86	25	0.19	
545	4.50	0.71	26	0.17	
887	4.30	1.22	27	0.09	
600	3.29	1.43	28	0.21	
178	4.18	1.09	29	0.09	
1351	4.42	1.79	30	0.05	
1502	4.60	1.80	31	0.00	
857	4.36	2.91	32	0.27	
302	4.14	2.43	33	0.14	
602	3.57	3.00	34	0.29	
3493	4.50	2.69	35	0.13	
299	4.57	2.50	36	0.07	
773	3.50	4.00	37	0.10	
339	3.71	3.57	38	0.29	
896	5.38	3.00	39	0.00	

Appendix B (continued)

Non-avionics

<u>BLACK</u>	<u>HUSBAND</u>	<u>INTERCEPT</u>	<u>KIDS</u>	<u>LESS15</u>	<u>MCIVERNS</u>	<u>MILINC</u>
.057	.966	3.349	.83	.78	677.50	10021
			.58	.57	76.15	8448
			.71	.64	41.26	9166
			1.08	.98	153.31	9843
			.99	.93	173.86	11114
			1.05	1.00	390.66	11697
			1.31	1.19	278.96	12238
			1.45	1.41	216.94	12618
			1.67	1.62	113.45	13092
			1.59	1.43	287.71	13566
			1.83	1.75	431.75	14128
			2.00	1.92	286.60	14414
			1.74	1.74	187.00	14563
			1.72	1.72	536.18	15329
			1.91	1.84	227.21	15794
			2.38	2.16	162.16	16287
			2.15	1.89	340.43	17212
			2.17	1.54	834.44	17745
			1.80	1.44	1242.00	18622
			2.12	1.64	434.52	19661

<u>MNONWAGE</u>	<u>MTOTDEBT</u>	<u>OVERSEAS</u>	<u>SAGE</u>	<u>SBOONIES</u>	<u>SSCHOOL</u>
1868	4.08	0.50	20	0.08	12.417
1820	3.85	0.12	21	0.05	
370	3.96	0.44	22	0.14	
1231	4.45	0.45	23	0.18	
1064	4.29	0.45	24	0.12	
379	4.29	1.15	25	0.09	
518	4.36	0.96	26	0.20	
709	4.33	1.06	27	0.09	
179	4.15	1.12	28	0.01	
774	4.43	1.67	29	0.12	
824	4.09	1.88	30	0.08	
284	4.49	1.62	31	0.11	
330	4.20	1.84	32	0.12	
697	4.43	3.28	33	0.15	
1131	4.05	2.63	34	0.14	
790	4.59	3.78	35	0.11	
413	4.23	3.83	36	0.09	
990	4.60	3.56	37	0.13	
910	4.38	3.26	38	0.12	
522	4.19	3.29	39	0.12	

**Appendix C: Input Values for the Variables Used to Estimate  
Spouse Full-time Income**

**Avionics**

<u>AGE</u>	<u>ASIAN</u>	<u>BLACK</u>	<u>EDUCATION</u>	<u>INTERCEPT</u>
20	.076	.058	13	3.9033

<u>LT12</u>	<u>SBOONIES</u>	<u>SKILL</u>	<u>SOVERSEAS</u>
.38	.50	.25	0.00
.43	.07	.14	0.00
.30	.10	.30	0.00
.05	.21	.26	.05
.11	.11	.32	2.16
.14	.19	.14	.86
.04	.17	.29	.71
.04	.09	.17	1.22
0.00	.21	.29	1.43
0.00	.09	.18	1.09
0.00	.05	.21	1.79
0.00	0.00	.20	1.80
0.00	.27	.27	2.91
0.00	.14	.43	2.43
0.00	.29	.29	3.00
0.00	.13	.19	2.69
0.00	.07	.14	2.50
0.00	.10	.30	4.00
0.00	.29	.24	3.57
0.00	0.00	.50	3.00

**Appendix C (continued)**

**Non-avionics**

<u>AGE</u>	<u>ASIAN</u>	<u>BLACK</u>	<u>EDUCATION</u>	<u>INTERCEPT</u>
20	.056	.057	12	3.9033

<u>LT12</u>	<u>SBOONIES</u>	<u>SKILL</u>	<u>SOVERSEAS</u>
.22	.08	.31	.50
.43	.05	.28	.12
.33	.14	.19	.44
.25	.18	.14	.45
.16	.12	.27	.45
.07	.09	.19	1.15
.06	.20	.23	.96
.05	.09	.22	1.06
.04	.01	.21	1.12
0.00	.12	.20	1.67
.03	.08	.20	1.88
.06	.11	.21	1.62
.02	.12	.30	1.84
.02	.15	.31	3.28
0.00	.14	.32	2.63
0.00	.11	.22	3.78
0.00	.09	.28	3.83
0.00	.13	.38	3.56
0.00	.12	.24	3.26
0.00	.12	.26	3.29

**Appendix D: Input Values for the Variables Used to Estimate**  
**the Probability of a Member Working**

**Avionics**

<u>BOONIES</u>	<u>INTERCEPT</u>	<u>KIDS</u>	<u>MILINC</u>
.38	2.952	.88	11294
.07		.79	8916
.20		.60	9105
.37		.95	10589
.32		1.00	12165
.19		1.19	12746
.08		1.50	12265
1.17		1.61	13539
.36		2.14	13197
.09		1.82	13343
.21		1.95	14077
.13		2.40	14038
.18		1.82	14835
.29		2.43	15427
.43		1.71	16569
.19		2.19	16425
.14		1.86	17582
.10		2.30	17689
.29		2.14	17725
0.00		1.75	18807

<u>MNONWAGE</u>	<u>MRANK</u>	<u>MTOTDEBT</u>	<u>SEPARATE</u>
2203	4.25	4.38	2.361
97	3.14	3.86	
224	3.30	3.70	
94	4.16	4.00	
1302	4.32	4.00	
379	4.57	3.95	
545	4.63	4.50	
887	5.00	4.30	
600	4.93	3.29	
178	5.27	4.18	
1351	5.42	4.42	
1502	5.53	4.60	
857	5.55	4.36	
302	5.86	4.14	
602	6.43	3.57	
3493	6.38	4.50	
299	6.79	4.57	
773	6.80	3.50	
339	6.81	3.71	
896	7.13	5.38	

**Appendix D (continued)**

**Non-avionics**

<u>BOONIES</u>	<u>INTERCEPT</u>	<u>KIDS</u>	<u>MILINC</u>
.03	2.952	.83	10021
.12		.58	8448
.21		.71	9166
.18		1.08	9843
.20		.99	11114
.11		1.05	11697
.17		1.31	12238
.15		1.45	12618
.07		1.67	13092
.18		1.59	13566
.14		1.83	14128
.09		2.00	14414
.18		1.74	14563
.11		1.72	15329
.13		1.91	15794
.22		2.38	16287
.17		2.15	17212
.17		2.17	17745
.16		1.80	18622
.17		2.12	19661

<u>MNONWAGE</u>	<u>MRANK</u>	<u>MTOTDEBT</u>	<u>SEPARATE</u>
1868	3.83	4.08	2.109
1820	2.97	3.85	
370	3.42	3.96	
1231	4.04	4.45	
1064	4.30	4.29	
379	4.63	4.29	
618	4.76	4.36	
709	5.05	4.33	
179	5.14	4.15	
774	5.47	4.43	
824	5.58	4.09	
284	5.62	4.49	
330	5.68	4.20	
697	5.97	4.43	
1131	6.25	4.05	
790	6.27	4.59	
413	6.53	4.23	
990	6.75	4.60	
910	7.18	4.38	
522	7.45	4.19	

**Appendix E: Input Values for the Variables Used to Estimate  
Military Income**

**Avionics**

<b><u>EDLEVEL</u></b>	<b><u>FLTPAY</u></b>	<b><u>MAGE</u></b>	<b><u>MOVERSEA</u></b>	<b><u>PROPAY</u></b>
13.45	0.00	19	2.25	0.00
	0.00	20	1.00	0.00
	0.00	21	0.00	0.00
	0.00	22	3.84	0.00
	0.05	23	12.37	0.00
	0.05	24	19.43	0.00
	0.04	25	18.50	0.00
	0.13	26	20.26	0.00
	0.00	27	22.79	0.00
	0.09	28	17.27	0.00
	0.05	29	33.37	0.00
	0.00	30	29.87	0.00
	0.00	31	57.73	0.00
	0.00	32	45.29	0.00
	0.14	33	56.43	0.00
	0.00	34	54.44	0.00
	0.00	35	52.21	0.00
	0.10	36	74.60	0.00
	0.00	37	68.33	0.00
	0.00	38	67.13	0.00

**Non-avionics**

<b><u>EDLEVEL</u></b>	<b><u>FLTPAY</u></b>	<b><u>MAGE</u></b>	<b><u>MOVERSEA</u></b>	<b><u>PROPAY</u></b>
13.29	0.03	19	10.53	0.00
	0.00	20	2.03	0.00
	0.01	21	4.41	0.01
	0.06	22	7.84	0.00
	0.01	23	12.31	0.00
	0.04	24	14.04	0.00
	0.09	25	15.48	0.02
	0.04	26	15.64	0.01
	0.03	27	24.85	0.05
	0.10	28	28.14	0.00
	0.05	29	35.67	0.05
	0.11	30	37.98	0.06
	0.02	31	37.92	0.00
	0.11	32	48.98	0.03
	0.13	33	50.61	0.02
	0.05	34	71.57	0.03
	0.05	35	58.11	0.01
	0.02	36	63.46	0.06
	0.10	37	65.80	0.02
	0.05	38	71.31	0.02

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The purpose of this study was to examine the impact of permanent change of station (PCS) moves on the family income of Air Force enlisted personnel in Avionics and Non-avionics career fields. The research had four basic objectives: (1) Evaluate the effect of unreimbursed moving expenses on family income. (2) Determine the impact of PCS moves on spouse earnings. (3) Examine the effect of PCS moves on member part-time income. (4) Compare the effect of PCS moves on the family income of Avionics personnel to members in other career fields.

The study revealed that the average unreimbursed moving expenses for Air Force enlisted personnel ranges from \$1,100 to \$2,415 depending on the type of move.

The research also found two important effects of moving on spouse income and member part-time earnings. First the expected income in both cases is generally lower during the year a family experiences a move as compared to the previous year. Additionally, moving more frequently during a typical 20-year career decreases the expected value of spouse income and member part-time income.

Finally, PCS moves were shown to have a similar impact on the family income of Avionics and Non-avionics personnel. For both groups, the expected value of the family income is very close.

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